4300T
Converged Network Appliance
User Manual

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Chapter 1: Introduction

Thank you for the purchase of your 4300T converged network appliance.

This User's Guide describes the 4300T converged network appliance. This document introduces the major features of the 4300T and describes how to perform physical installation and system configuration. This User's manual is intended for network installers, network operators, and security officers.

Typographic conventions

Steps in any particular task are presented using an alphabetized list as follows:

A.
B.
C.

User input is displayed in **boldface** type and can represent either keyboard input or mouse selections in a browser window depending on the context.

Web GUI menus and input areas are called out using *italics.*

Informational statements are denoted using the symbol and are presented using green type.

WARNING statements are denoted using the symbol and contained inside of grey text boxes using red type.

The 4300T Converged Network Appliance

The EdgeMarc 4300T is an intelligent, all-in-one networking solution for enterprises and service providers. It reduces costs by simplifying the deployment, management and security of converged voice, video and data networks. The 4300T provides the following important functions for converged networks:

T1 Wide Area Network (WAN) Access Router
The 4300T provides an integrated T1 CSU/DSU for small and medium office connectivity.

Security
A stateful packet inspection firewall is used in combination with a VoIP application layer gateway to provide comprehensive "media-aware" security. The 4300T also supports IPSec for secure site-to-site networking.

VoIP
The 4300T resolves NAT/FW traversal problems for SIP, MGCP and H.323 traffic. It allows a single public IP address to be used for multiple VoIP clients. VoIP survivability is also provided by the 4300T so that local SIP PSTN gateways can be used for inbound/outbound calling during WAN link failures.

Quality of Service
The 4300T maximizes WAN link utilization while optimizing voice quality using prioritization and shaping.

Call Quality Monitoring
Passive call quality monitoring for each VoIP call includes statistics needed to enforce SLAs and resolve networking problems that negatively affect call quality.

Future-proof Scalability
The 4300T is a powerful, flexible platform that can be deployed initially as a low-cost WAN access router and then licensed through software for more advanced VoIP features and increased call performance. It is the ideal platform for service providers offering DIA, hosted VoIP and managed security services or enterprises migrating to converged voice and data networks.

Feature Summary

VoIP
- SIP, MGCP and H.323 application layer gateway enables a single public IP address to be used for multiple VoIP endpoints
- VoIP survivability provides local call switching to PSTN gateways during WAN link failures (SIP only)

QoS
- Class based queuing/prioritization
- Diffserv marking and policing
- Traffic shaping
- VoIP call admission control prevents oversubscription of priority queue

Security
- Stateful packet inspection firewall

- VoIP aware firewall dynamically provisions and closes UDP ports used for VoIP calls
- IPSec: 3DES, SHA-1
- NAT/PAT server hides enterprise LAN topology

Passive Call Quality Monitoring

- Per call statistics include mean opinion score (average and minimum), jitter, latency, packet loss and much more
- Alarms for poor MOS scores
- Active call count indicators

Front Panel LEDs

The LEDs display real-time information for key functions of the 4300T. They are as follows:

LED Label	Activity	Description
Power	Off	Power switch off (or no power from wall)
	Green	Power is supplied to the unit
Status	Off	Self-tests have failed. The unit has not booted.
	Green	Self-tests completed successfully
	Flashing	Indicates configuration is being written to permanent storage or an upgrade is in progress
T1/E1	Off	The T1 is in an alarm state and not synchronized
	Green	T1/E1 in-sync, no alarms
LAN	Link/Act	Flashing indicates activity. On indicates a connection
	100Mbps	On = 100Mbps link speed, Off = 10Mbps link speed
Ethernet WAN	Link/Act	Flashing indicates activity. On indicates a connection
	100Mbps	On = 100Mbps link speed, Off = 10Mbps link speed

Back Panel

The back panel of the 4300T contains the following (left to right):

- Power connector
- Erase button
- Power connector
- 4 switched LAN Ethernet ports
- Management console port
- T1 WAN port (RJ-48 with built-in CSU/DSU)
- Ethernet WAN port

Power Connector

The 4300T comes with an AC power cord and power adapter for connecting to this port. Little force is necessary when the plug is properly positioned.

Erase Button

To erase any custom configuration and restore the 4300T to its factory default state depress the erase button once and press again before 2 seconds expires.

WARNING: Using the Erase button as outlined above means any configuration made to the 4300T will be lost. Additionally the VoIP ALG registration code must be re-entered in the 4300T as covered in *Chapter 4: System Diagnostics, viewing the ALG registration code*. Erasing the configuration means that IP phones installed behind the 4300T will not work and Internet connectivity or network access for PCs will be down until the system is reconfigured.

Management console port

This port is used to establish a local console session with the 4300T using a VT100 terminal or emulation program. The cable required is a straight-through 8-wire cable. The serial port uses a baud rate of 9600, 8 data bits, 1 stop bit and no parity.

This port is used for debug or local diagnostic purposes only. Primary configuration of the 4300T is performed from a web browser as covered in ***Chapter 3: Configuring the 4300T***.

T1/E1 WAN port

The T1 WAN interface with the following features:

- Fully integrated CSU/DSU
- T1 support
- Fractional T1 support
- Layer 2 protocol support for: HDLC, Cisco HDLC (cHDLC), PPP, Frame Relay
- On-board RJ-48 connector for easy direct connection
- T1/E1 framer and transceiver
  - B8ZS/HDB3 zero suppression
  - Response to Inband Loop codes
  - Manual payload loop through the GUI
- External transmit clock input and receive clock output headers
- Timing: internal or external (loop times from the network)
- Provides long haul CSU or short haul DSU signaling
- Meets FCC part 68 protection requirements

The WAN port is used for connection to a data T1 line. The device at the far end of the line is a router or other device expecting TCP/IP data. Individual DS-0 channels on the T1 are not used to carry uncompressed voice.

Ethernet WAN port

The ethernet 10/100 Mbps port on the 4300T can be used as a WAN interface as an alternative to the T1 interface. This port is typically used when connecting the 4300T to an existing T1/E1 WAN router, cable or xDSL modem.

Chapter 2: Getting Started

Physical Installation

The 4300T is designed for desktop, rack or wall-mount installation. Please observe the following guidelines when installing the system:

- Never assume that the AC cord is disconnected from a power source. Always check first.
- Always connect the AC power cord to a properly grounded AC outlet to avoid damage to the system or injury.
- Ensure that the physical location of the installation has adequate air circulation and meets the minimum operating conditions as provided in the environmental specifications for the system. These can be found on our website at www.edgewaternetworks.com.

WARNING: Secure the power supply using a fastener or nearby shelf so that it does not hang from the power connector.

Desktop Installation

A. Remove the 4300T and accessories from the shipping container.

B. Place the 4300T on a flat, dry surface such as a desktop, shelf or tray.

C. Connect the power and network cables to the appropriate ports on the back of the system.

CAUTION: To reduce the risk of fire, use only 26 AWG or larger wire (e.g. 24, 22, 20, etc.) to connect the T1 port on your unit to an RJ-45 jack.

Wall-Mount Installation

The 4300T can be wall-mounted using the two mounting brackets on the bottom of the appliance. We recommend using two round or pan head screws.

A. Install two screws 4 14/16″ horizontally apart on a wall or other vertical surface. The screws should protrude from the wall so that you can fit the appliance between the head of the screw and the wall.
B. If you install the screws in drywall use hollow wall anchors to ensure that the unit does not pull from the wall due to prolonged strain from the cable and power connectors.
C. Remove the 4300T and accessories from the shipping container.
D. Hang the 4300T on the wall.
E. Connect the power and network cables to the appropriate ports on the back of the system.

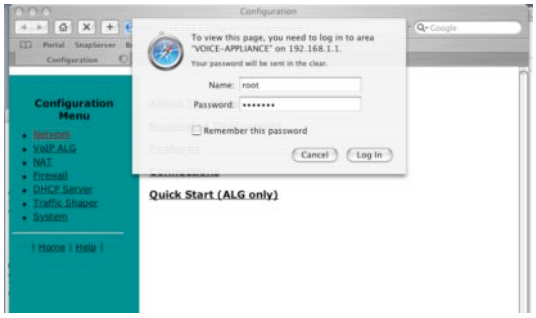
WARNING: Secure the power supply using a fastener or nearby shelf so that it does not hang from the power connector.

CAUTION: To reduce the risk of fire, use only 26 AWG or larger wire (e.g. 24, 22, 20, etc.) to connect the T1 port on your unit to an RJ-45 jack.

Administration of the 4300T

The 4300T is configured using a web browser such as Internet Explorer or Netscape Navigator. The 4300T is shipped with a pre-configured IP address for its LAN port of 192.168.1.1. To connect to the 4300T, do the following:

A. Connect a PC using an IP address of 192.168.1.2 and subnet mask of 255.255.255.0 to LAN port 4 of the 4300T.
B. Launch a web browser on the PC and enter the URL string: **192.168.1.1**. Press **Return**. The initial 4300T *main configuration* menu appears.
C. Select the **Network** link - enter the username **root** and the password **default** to log into the system.



IMPORTANT: For secure management of your network, be sure to change the default userid and password as described under ***Change the Administration Password***.

D. Continue to configure the system using the information provided in "Chapter 3: Configuring the 4300T".

Chapter 3: Configuring the 4300T

The 4300T is a flexible, easy to use converged network appliance that provides many critical networking functions for IP based voice and data. It can be installed in several different VoIP topologies:

- At the customer premise for IP Centrex applications
- At the station side of enterprise IP PBXs
- At the trunk side of enterprise IP PBXs

Most users will follow the steps provided in the "Configuring The Systems Settings" section of this manual to initially connect the 4300T into their IP network. The remainder of the configuration can be different based on the application, VoIP topology and presence of other networking equipment such as firewalls or DHCP servers. In general, however, the steps used to configure the 4300T are:

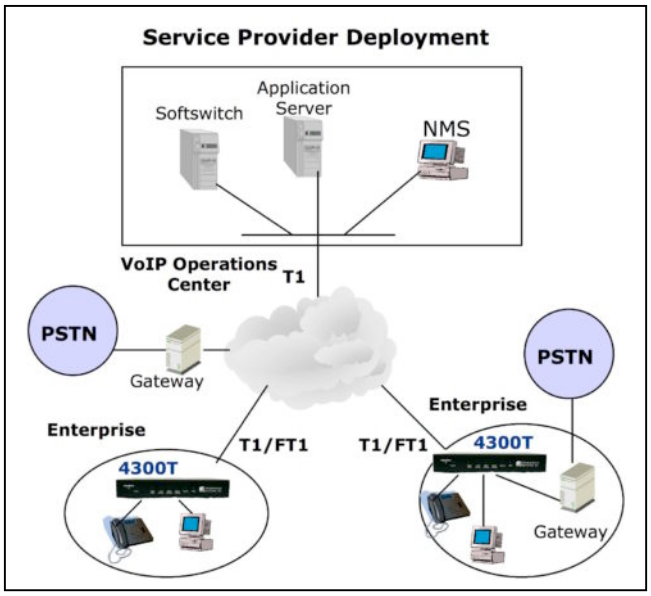
Step	Task
1	System configuration
2	VoIP configuration
3	Data networking configuration
4	Firewall configuration
5	Traffic management configuration
6	VoIP survivability configuration

Some of the steps are optional depending on your particular application. We have provided configuration guidelines below for each of the application types supported by the 4300T. Additional application notes can be found on our website at www.edgewaternetworks.com.

Configuration Guide For IP Centrex Applications

A typical 4300T installation for an IP Centrex application requires no external router or firewall. The 4300T WAN port is connected directly to the T1/E1 line and the LAN port(s) are connected directly to enterprise devices and/or Ethernet switches.

VoIP signaling is performed in the service provider network via a softswitch and the 4300T acts as a proxy for the voice devices installed in the enterprise LAN. In this configuration a single public IP address is used to proxy for all of the IP phones and to route to multiple PC's installed on the LAN.



The 4300T performs the following functions in this application:

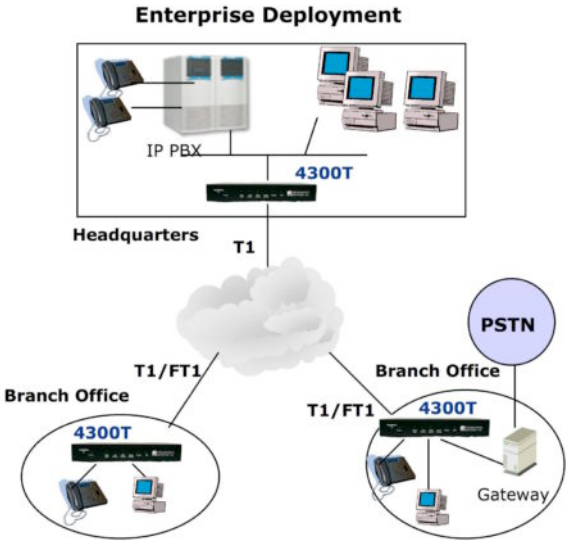
- WAN/LAN IP routing.
- Traffic shaping and priority queuing to guarantee high quality voice traffic. These mechanisms protect voice and data traffic from contending for the same network resources to guarantee low latency and the highest call quality possible for VoIP traffic. At the same time they ensure the best utilization of WAN bandwidth by enabling data traffic to burst up to full line rate in the absence of voice calls. Precedence is automatically given to traffic coming from IP phones and other devices using the 4300T's Application Layer Gateway function.
- NAT/PAT translation for IP phones and PC's. This allows a single public IP address to be used on the WAN link to represent all of the private IP addresses assigned to the LAN IP phones and PC's.
- Static NAT entries. This enables the customer to use a WAN public IP address for data servers (web, mail, ftp, etc.) connected behind the 4300T. These servers can then be configured with private IP addresses for additional security.
- A "VoIP" aware firewall. A full Layer 7 gateway for voice traffic and a stateful packet inspection firewall for data traffic.
- Call Admission Control (CAC). CAC uses a deterministic algorithm to decide when there are insufficient network resources available to adequately support new calls and then return the equivalent of a "fast busy" to new call requests.
- DHCP server and TFTP relay. These features are used to simplify and expedite the IP configuration of phones and PC's. This also includes VoIP signaling gateway information (MGCP, SIP, H.323 and SCCP).
- Call quality monitoring (using MOS, jitter, latency, packet loss and much more) and test tools.
- VoIP survivability. Provides call switching to an LAN based PSTN gateway during WAN outages.

Configuration Outline

Task	Subtask	Configure For IP Centrex Application?
System Configuration	configure LAN/WAN interface	**Yes**
	set ethernet link rate	Optional
	enable the DHCP server	Optional but recommended
	configure SNMP	Optional
VoIP Configuration	enable the VoIP ALG	**Yes**
	configure a VoIP subnet route	Optional
Data Networking Configuration	dynamic NAT	Optional but recommended
	static NAT	Optional
	static IP routing	Optional
Firewall Configuration	enable the data firewall	**Yes**
	configure basic settings	Optional
	configure advanced settings	Optional
Traffic Management Configuration	enable traffic shaping	**Yes**
	enable Call Admission Control	Optional
VoIP Survivability	enable VoIP survivability	**Yes**
	configure call processing server reachability settings	Optional
	specify the number of digits to use for local dialing	Optional
	configure the IP address of the local LAN side PSTN gateway	Optional
	configure call processing server redundancy	Optional

Configuration Guide For Station Side IP PBX Applications

Most private enterprise VoIP networks use an IP PBX at the corporate headquarters location to provide voice switching between headquarters, branch offices and the PSTN. The 4300T is used in these environments to securely connect branch office employees to the IP PBX installed in the corporate headquarters location.



The installation of an 4300T on the station side of an enterprise IP PBX is very similar to the IP Centrex application above. The branch office is connected to the corporate network using a private T1/E1 link connected directly to the WAN port of the 4300T. The LAN port(s) of the 4300T are connected directly to enterprise devices and/or Ethernet switches.

The IP PBX in the corporate headquarters location performs VoIP signaling and the 4300T acts as a proxy for the voice devices installed at the branch office. The 4300T can perform the following functions in this application:

- WAN/LAN IP routing.

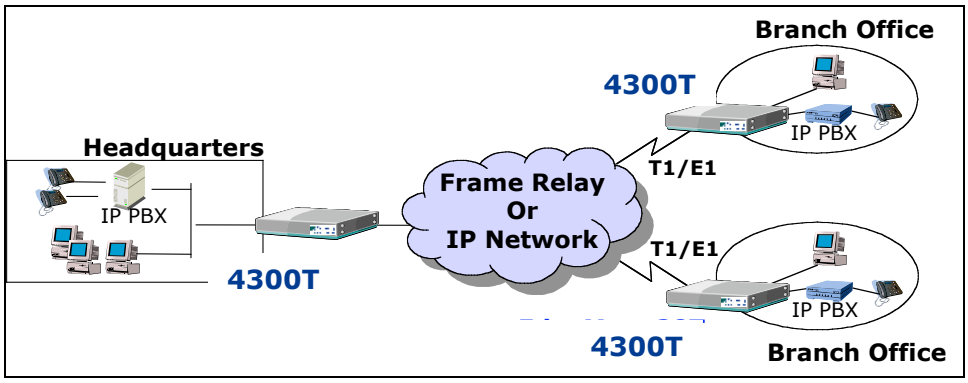
- Traffic shaping and priority queuing to guarantee high quality voice traffic. These mechanisms protect voice and data traffic from contending for the same network resources to guarantee low latency and the highest call quality possible for VoIP traffic. At the same time they ensure the best utilization of WAN bandwidth by enabling data traffic to burst up to full line rate in the absence of voice calls. Precedence is automatically given to traffic coming from IP phones and other devices using the 4300T's Application Layer Gateway function.
- NAT/PAT translation for IP phones and PC's. This allows a single IP address to be used on the WAN link to represent all of the private IP addresses assigned to the LAN IP phones and PC's.
- A "VoIP" aware firewall. A full layer 7 gateway for voice traffic and a stateful packet inspection firewall for data traffic.
- Call Admission Control (CAC). CAC uses a deterministic algorithm to decide when there are insufficient network resources available to adequately support new calls and then return the equivalent of a "fast busy" to new call requests.
- DHCP server and TFTP relay. These features are used to simplify and expedite the IP configuration of phones and PC's. This also includes VoIP signaling gateway information (MGCP, SIP, H.323 and SCCP).
- Call quality monitoring and test tools.
- VoIP survivability. Provides call switching to an LAN based PSTN gateway during WAN outages.

Configuration Outline

Task	Subtask	Configure For Station Side IP PBX Application?
System Configuration	configure LAN/WAN interface	**Yes**
	set ethernet link rate	Optional
	enable the DHCP server	Optional but recommended
	configure SNMP	Optional
VoIP Configuration	enable the VoIP ALG	**Yes**
	configure a VoIP subnet route	Optional
Data Networking Configuration	dynamic NAT	Optional but recommended
	static NAT	Optional
	static IP routing	Optional
Firewall Configuration	enable the data firewall	**Yes**
	configure basic settings	Optional
	configure advanced settings	Optional
Traffic Management Configuration	enable traffic shaping	**Yes**
	enable Call Admission Control	Optional
VoIP Survivability	enable VoIP survivability	**Yes**
	configure call processing server reachability settings	Optional
	specify the number of digits to use for local dialing	Optional
	configure the IP address of the local LAN side PSTN gateway	Optional
	configure call processing server redundancy	Optional

Configuration Guide For Trunk Side IP PBX Applications

Companies with existing IP-based WAN links for inter-office voice and data communications can use the 4300T as a traffic shaper to meet the stringent jitter, latency and packet loss requirements for toll quality voice. The 4300T is deployed at the edge of the WAN in both headquarters and branch office locations, as shown below.



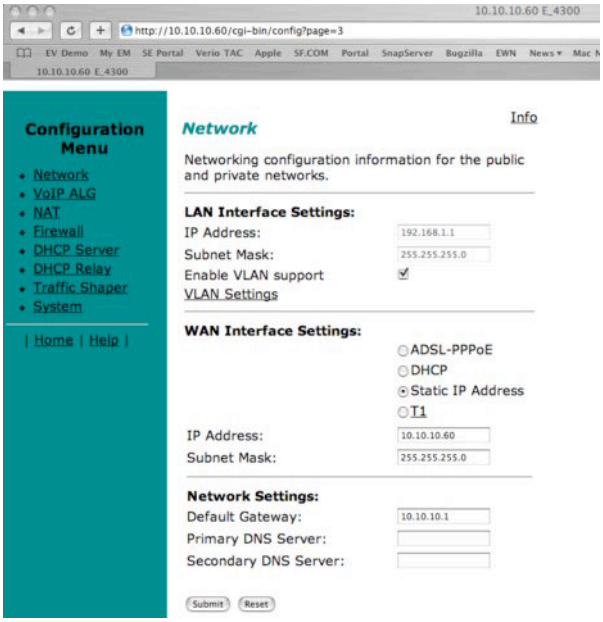
The 4300T performs WAN/LAN IP routing and traffic management functions in this application. In particular, it provides prioritization to ensure voice packets are not delayed or dropped while allowing data traffic to use all remaining bandwidth.

Configuration Outline

Task	Subtask	Configure For Trunk Side IP PBX Application?
System Configuration	configure LAN/WAN interface	**Yes**
	set ethernet link rate	Optional
	enable the DHCP server	Not required
	configure SNMP	Optional
VoIP Configuration	enable the VoIP ALG	Not required
	configure a VoIP subnet route	Not required
Data Networking Configuration	dynamic NAT	Not required
	static NAT	Not required
	static IP routing	Not required
Firewall Configuration	enable the data firewall	Not required
	configure basic settings	Not required
	configure advanced settings	Not required
Traffic Management Configuration	enable traffic shaping	**Yes**
	enable Call Admission Control	Not required

System Configuration

This section explains how to configure the 4300T to function in your IP network. You will configure the T1/E1 WAN interface, Ethernet interfaces, network addresses, DNS settings, default gateway, SNMP settings and change the administrative password.



A. Physically connect to the 4300T as described in ***Administration of the 4300T***.

   A browser-based configuration GUI should appear, as shown here.

B. Select the **Network** entry in the Configuration Menu.

Configure the LAN interface

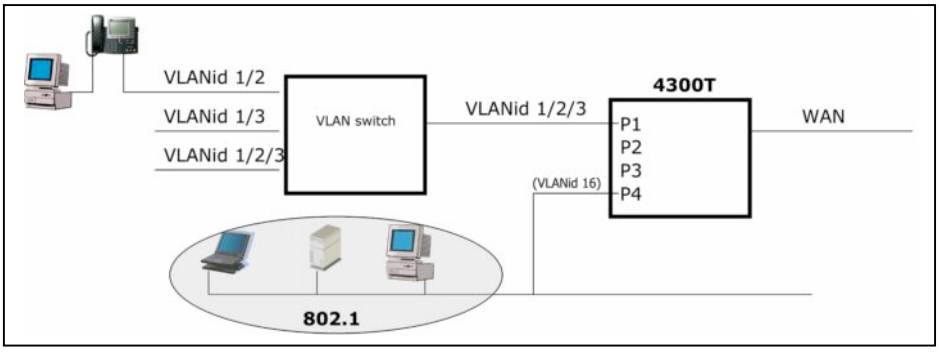
The 4300T provides an integrated 4 port 10/100 Mbps ethernet switch that can be optionally configured to support 802.1q VLANs. Integrated VLAN support simplifies the integration of the 4300T with existing VLAN-based networks. The 4300T is able to receive 802.1q-tagged packets from a downstream VLAN switch and appropriately route and process them per its firewall rules. Packets received from the WAN are placed in the appropriate VLAN based on IP address routing.

By default VLANs are not enabled and a single IP address is used for all 4 ethernet ports. The configuration of this address is as follows:

A. Enter the **IP Address**.
B. Enter the **Subnet Mask** (e.g. 255.255.255.0).
C. Press **Submit**.

Configuring VLANs in the 4300T

As depicted in the diagram below VLANs are used to connect the 4300T to an ethernet switch that has been configured to use VLANs.



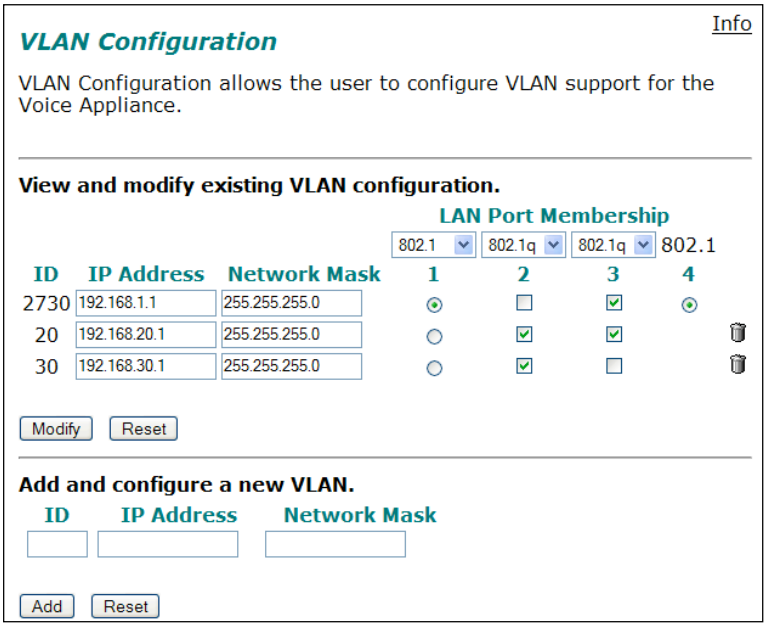
Typically, all VoIP devices are placed in the same VLAN while data devices are placed in a different VLAN. This is to ensure priority treatment of the VoIP traffic on the LAN. Note that the 4300T does not require VLANs to prioritize VoIP traffic; prioritization is determined by the VOS Application Layer Gateway, regardless of VLAN. Some important notes about VLANs:

- A physical LAN port will operate in **either** 802.1 or 802.1q mode, not both simultaneously
- The 4300T supports up to 16 VLANs
- A unique IP Subnet is assigned to each VLAN
- You can associate one or more VLANs to each LAN port operating in 802.1q mode
- Traffic **within** a VLAN is switched among all ports with membership
- Traffic **between** VLANs is routed by the 4300T
- The 4300T ALG can only be assigned to one VLAN id
  - Only ALG traffic is prioritized over the WAN
  - Other non-VoIP traffic in the same VLAN will not receive priority treatment
- A DHCP server can be enabled/disabled per VLAN
- Cisco Discovery Protocol is **not** supported
- 802.1p is not currently supported

A. Select the **Network** link.
B. Select **Enable VLAN support.**
C. Press **Submit.**

Be careful when changing a port from 802.1 to 802.1q mode. Any 802.1 devices connected to that port (such as your management PC!) will loose access to the 4300T. Port 4 is only able to receive 802.1 frames, so a PC can always be connected to this port if the configuration of the other ports is unknown.

D. Select **System**
E. Select **VLAN Configuration**
F. Adjust **LAN Port Membership** drop-down boxes to specify 802.1 or 802.1q mode, as desired. Press **Modify**.
If changing modes, the radio-buttons or checkboxes will change from one style to the other.
G. Under **Add and configure a new VLAN** enter a new VLAN ID, the


Info
VLAN Configuration
VLAN Configuration allows the user to configure VLAN support for the Voice Appliance.
View and modify existing VLAN configuration.
LAN Port Membership
802.1 802.1q 802.1q 802.1
ID IP Address Network Mask 1 2 3 4
2730 192.168.1.1 255.255.255.0
20 192.168.20.1 255.255.255.0
30 192.168.30.1 255.255.255.0
Modify Reset
Add and configure a new VLAN.
ID IP Address Network Mask
Add Reset

4300T's IP address within this VLAN, and the Network Mask. Press **Add.** A new VLAN entry will be added to the VLAN Configuration above.

H. Depending on the mode of a physical port, assign it to one or more VLANs:
802.1 mode: Assign the port to any ONE VLAN.
802.1q mode: Assign the port to any number of VLANs

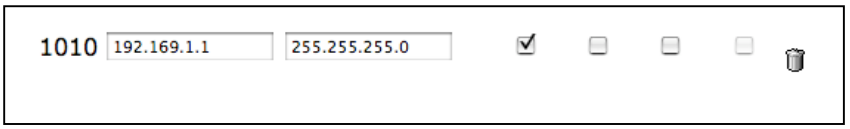
Perform steps A through F above for each VLAN you wish to create.

Modify an Existing VLAN Configuration

A. Select the **Network** link.
B. Select **VLAN Settings.**
C. Change the desired settings.
D. Press the **Modify** to modify the VLAN. The **Reset** button will restore the input area being modified to its previous value.

Delete an Existing VLAN Configuration

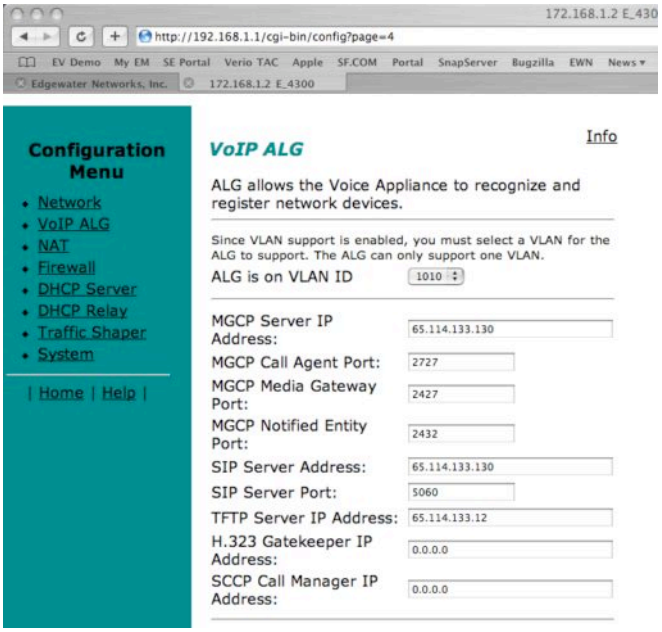
A. Select the **Network** link.
B. Select **VLAN Settings.**
C. Press the **trash can** icon next to the VLAN you wish to delete.



Assign the 4300T's ALG to your Priority VLAN

Once you have completed your VLAN configuration you must assign the 4300T ALG to the VLAN containing your VoIP phones.

E. Select the **VoIP ALG** from the main configuration menu.
F. Use the drop down menu to assign the ALG to the **VLAN ID** containing your VoIP phones.
G. Press **Submit.**



Configure the WAN interface

The 10/100 Ethernet WAN port is configured as follows:

A. Select **ADSL-PPPoE** if you want to connect to Internet using ADSL and your ISP has given PPPoE username and password. Press **Submit.** You will be prompted to enter **username** and **password,** enter these and press **Submit** again.
B. Select **DHCP** if you want to get WAN side IP address using DHCP server available in WAN side of the network. Press **Submit**.

C. Select **Static IP address** if you want to manually assign the IP address configuration to the ethernet WAN interface.
D. Enter the **IP Address.**
E. Enter the **Subnet Mask** (e.g. 255.255.255.0).
F. Enter the **Default Gateway**. This is usually the upstream router's IP address. Packets destined for IP networks not known to the 4300T are forwarded to the default gateway for handling.
G. Enter the **Primary DNS Server**. The DNS server is used by the 4300T to resolve domain names to IP addresses. The value entered into this field is provided to IP devices that use the 4300T as a DHCP server. The 4300T VoIP ALG also uses it if domain names are used instead of IP addresses to identify signaling and/or TFTP servers (see the section entitled "Configuring the VoIP ALG" for more details).
H. Enter the **Secondary DNS Server**. This server will be used in the event that the primary DNS server is not reachable.
I. Press **Submit**.

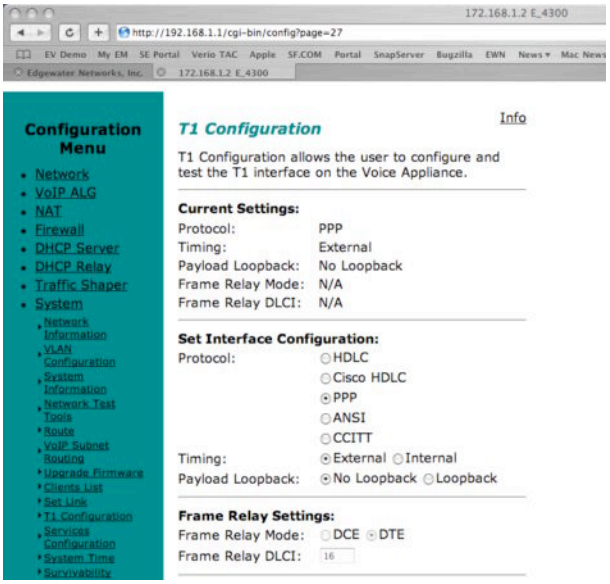
To enable the T1 interface:

A. Select **Network**.
B. Select the **T1** radio button.
C. Select **Submit.**

To configure the T1 parameters:

A. Select **Network**.
B. Select the **T1** link next to the radio button to proceed to the **T1 Configuration** page.

The T1configuration menu will display, as shown here.



The 4300T supports a wide range of T1/E1 Layer 2 configuration parameters. The specific values you will need must be supplied by the WAN provider.

Each of the 4300T's configurable parameters are described below.

Protocol

Display and set the T1 Layer 2 protocol. Supported protocols are:

- HDLC
- Cisco HDLC
- PPP
- ANSI (Frame Relay)
- CCITT (Frame Relay)

C. Select the desired T1 **protocol**.

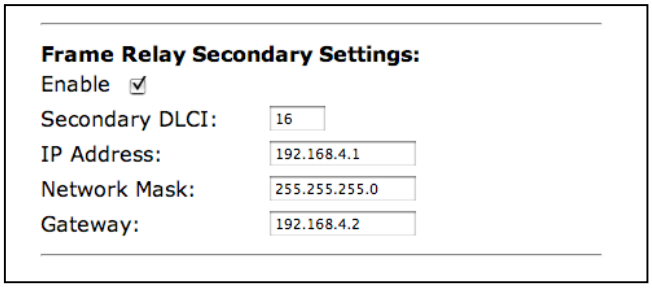
D. Press **Submit**.

Frame Relay Mode and DLCI
When the Protocol is one of **ANSI** or **CCITT**, then additional Frame Relay configuration parameters are required.

The **Frame Relay Mode** is usually set to **DTE** for the customer premises.

The **Frame Relay DLCI** is set by the WAN provider and identifies the far-end device across the Frame Relay network. This DLCI can also be used to carry voice traffic only by enabling the **Secondary DLCI** for data**.**

Most installations will use a single DLCI for both voice and data traffic. However, in instances where the network will provide a different quality of service based on DLCI number it is desirable to place all voice traffic on one DLCI and then configure a second DLCI for data. In this case, the **Secondary DLCI** is configured as follows:



A. Select **Network**.
B. Select the **T1** link next to the radio button to proceed to the **T1 Configuration** page.
C. Select **Enable** in the **Frame Relay Secondary Settings** section of the page.
D. Enter the **Secondary DLCI, IP Address, Network Mask** and **Gateway** for the data traffic using the **Secondary DLCI**.

Timing
Display and set the clock timing source for the T1/E1 interface. The timing can be either derived from the network (**External**) or provided to the T1 interface by the EdgeMarc (**Internal**). With a carrier-provided T1, the timing is usually derived from the network (External, the default setting).

Warning: Mismatched timing modes can result in WAN connectivity but with intermittent data loss.

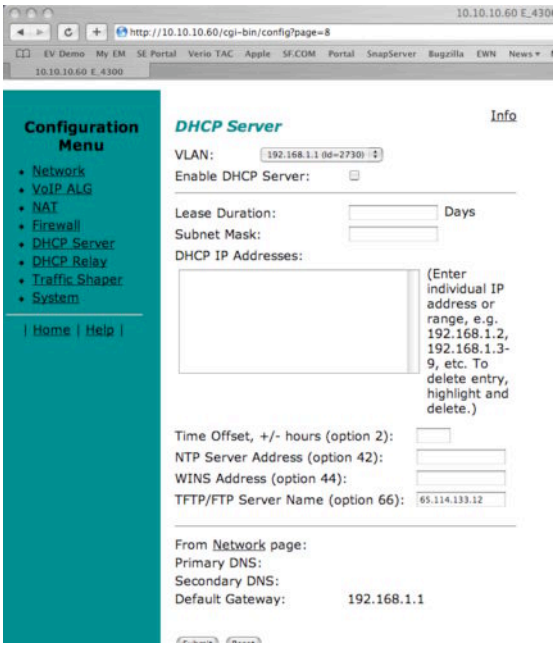
Payload Loopback
Display and set the loopback setting. During T1 line testing the local interface can be set to **Loopback** to allow the network provider to verify connectivity and line quality. For normal operation the setting should always be **No Loopback** (the default setting).

Configure the DHCP Server

The 4300T can act as a DHCP server granting IP addresses to PCs, workstations, servers or voice devices (IP phones, IADs or softphones) connected to its LAN interfaces. DHCP is a protocol that enables IP devices to obtain temporary or permanent IP addresses (out of a pool) from centrally administered servers.

The user can configure blocks of IP addresses, a default gateway, DNS servers, NTP server address, Time offset from NTP value, WINS address and TFTP/FTP server name that can be served to the requesting IP devices.

In addition the 4300T will provide its LAN IP address in DHCP user options 150 and 151 for



use by IP phones. Some IP phones use these values for configuration of their TFTP server and MGCP control server addresses.

PLEASE note: The DHCP server in the 4300T should not be used if a DHCP server already exists in the same subnet as the 4300T. Also, it is recommended that you assign static IP addresses for common-access devices such as network printers or fax machines.

You can also enable or disable the 4300T DHCP server on a per VLAN basis.

A. Select **DHCP Server**.

B. If you are using VLANs select the desired **VLAN** ID from the drop down menu.

C. The default value for the DHCP server is **disabled**. Click the top checkbox to enable or disable the internal DHCP server (default is disabled). If you are using VLANs select the desired **VLAN** ID.

D. Enter the **Lease Duration**.

The lease duration is the amount of time in days that an IP device may use an assigned IP address before requesting that it be renewed. The default value is 7 days and the valid range of input is 1 to 30 days.

E. Enter the **Subnet Mask**.

This is the subnet mask that will be sent via DHCP to the requesting IP devices.

F. Enter the **DHCP IP Addresses**.

This is the pool of IP addresses that will be provided to the requesting IP devices. You can enter both individual IP addresses or a range of addresses using the following format:

192.168.1.2 (single address)
192.168.1.4-10 (address range 192.168.1.4 through 192.168.1.10)

PLEASE note: The range format can only be used for class C addresses (those with a subnet mask of 255.255.255.0).

G. Enter the **Time Offset (DHCP user option 2)**.

Set the time offset in hours from UTC for your local location. This value is optional; if supplied, it will be delivered to clients.

H. Enter the **NTP Server Address (DHCP user option 42)**.

This is the IP address of a Network Time Server. This value is optional; if supplied, it will be delivered to clients.

I. Enter the **WINS Address**.

PLEASE note: If you are not using WINS leave this field blank.

The Windows Internal Naming Service (WINS) is a service that keeps a database of computer name-to-IP address mappings so that computer names used in Windows environments can be mapped to IP addresses. The WINS Address is the IP address of the WINS server in your network. This value will be delivered to clients.

J. Enter the **TFTP/FTP Server Name (DHCP user option 66)**.

Some IP phones use this setting to locate the TFTP or FTP servers which contain the phone software image used during boot. By default this option is the same as the TFTP server on the **VoIP ALG** page.

K. **Primary** and **Secondary DNS**

The primary and secondary DNS values come from those set under the WAN interface configuration, see ***Configure the WAN interface***. These values will be delivered to clients.

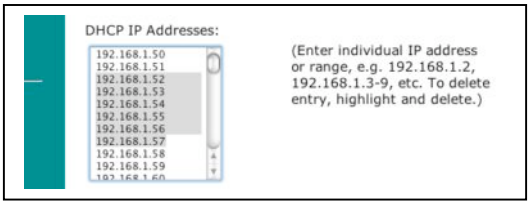
L. **Default Gateway**

The default gateway is automatically set to the 4300T's LAN address, see ***Configure the LAN interface***. This value will be delivered to clients.

M. Press **Submit**.

Delete a DHCP IP Address

A. Select **DHCP Server**.
B. To delete an IP address or a range of IP addresses **highlight** an entry or range of entries in the *DHCP IP Addresses* list and press the **Delete** key on your keyboard.
C. Press **Submit**.



Disable The DHCP Server

A. Select **DHCP Server**.
B. **Uncheck** the *Enable DHCP Server* checkbox.
C. Press **Submit**.

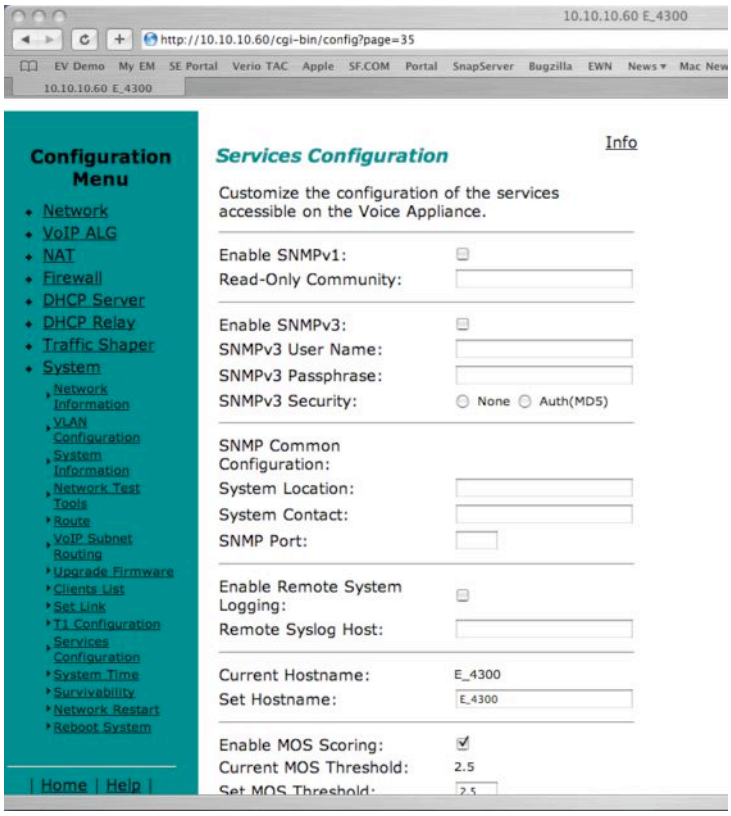
Configure Hostname, SNMP and Remote Logging

The 4300T can be managed remotely by an SNMP network management system such as HP Openview. The 4300T supports SNMPv1 or SNMPv3 and MIB-II (RFC1213). All MIB-II variables are read only. The MIB variables sysContact and sysLocation are set by the web GUI.

Messages generated by the 4300T can be sent to a remote log server.

The configuration screen is reached through the **Configuration Menu**:

A. Select **System**.
B. Select **System Overview**.
C. Select **Services Configuration**.



Configure SNMP

A. Select the **Enable SNMP** v1 or v3 checkbox. If using SNMPv1 enter the **Read-Only Community**. If using SNMPv3 enter the **User Name, Passphrase** and **Security** method.

B. Enter the **System Location**.

   This is a comment string that can be used to indicate the physical location of the 4300T. By default, no value is set.

C. Enter the **System Contact**.

   This is the administrative contact information for the 4300T. By default, no value is set.

D. Enter the **SNMP Port**.

   This is the port that the 4300T uses for SNMP communications with the network management system. The default is 161.

E. Press **Submit**.

Disable SNMP

A. Select **System**.
B. Select **System Overview**.
C. Select **Services Configuration**.

D. **Uncheck** the *Enable SNMP* checkbox.
E. Press **Submit**.

Configure Remote System Logging

The 4300T can be configured to log system messages to an external syslog server.

A. Select the *Enable Remote System Logging* checkbox.
B. Enter the IP address of the **Remote Syslog Host**.
   By default messages are sent to the remote host on port 514. This port can be changed by using the syntax ADDRESS:PORT.
C. Press **Submit**.

Disable Remote System Logging

A. Select **System**.
B. Select **System Overview**.
C. Select **Services Configuration**.
D. **Uncheck** the *Enable Remote System Logging* checkbox.
E. Press **Submit**.

Configure a local Hostname

A locally configured hostname is useful for remote management. This name can appear as the identifier string for the 4300T on a system management console.

A. Enter a **host name** in the field provided.

Enable Mean Opinion Scoring (MOS)

The 4300T produces useful statistics on a per call basis that can be written to syslog. These include MOS, jitter, latency, packet loss and much more.

A. Select **System**.
B. Select **System Overview**.
C. Select **Services Configuration**.
D. Select **Enable MOS**.

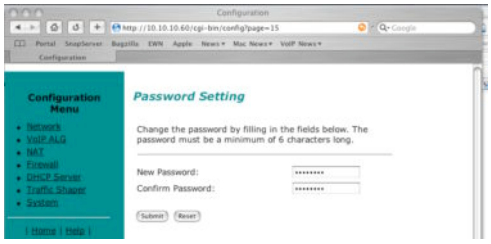
Set MOS Threshold

You can define a minimum MOS value in the 4300T such that a message will be sent to syslog when the measured MOS value drops below the minimum. This is useful when for monitoring a particular location for call quality problems and enables pro-active resolution of problems that negatively affect call quality.

A. Select **System**.
B. Select **System Overview**.
C. Select **Services Configuration**.
D. Enter the minimum MOS threshold in the **Set MOS threshold** field.
E. Press **Submit**

Change the Administration Password

We strongly recommend that you change the default password for the "root" administrative account using the following steps:



A. Select **System**.
B. Select **changed** in the *Change Password* section of the GUI.
C. Enter the **New Password**.

PLEASE note: the new password must be between 6 and 20 characters in length. Any combination of alpha and numeric characters is accepted.

D. Enter the **password** you chose in step C again in the *Confirm Password* to ensure that there were no mistakes in the initial entry.
E. Press **Submit**.

VoIP Configuration

The 4300T provides a VoIP application layer gateway (ALG) for the SIP, MGCP, H.323 and SCCP protocols. The ALG proxies the connection between the VoIP softswitch or IP PBX and voice devices such as IP phones, IADs or softphones. By acting as a proxy the 4300T is able to provide several important functions for IP based voice:

- Provide NAT/PAT services for voice traffic. NAT/PAT for VoIP enables you to use a single public IP address on the WAN interface of the 4300T to represent multiple private IP addresses assigned to voice devices on the LAN. The NAT function maps both IP address and IP port number between the public and private addresses so that all signaling and VoIP media packets are translated. A single public IP address can support up to 253 voice devices.

- Provide security services for voice traffic.
  - NAT/PAT services hide enterprise LAN topology from hackers.
  - The ALG acts as a "voice aware" firewall and ensures only authenticated voice traffic enters the enterprise LAN. This is accomplished by the dynamic provisioning of signaling and media ports for authenticated voice devices. The implementation is stateful and open ports are closed automatically when no longer required to support the voice call.

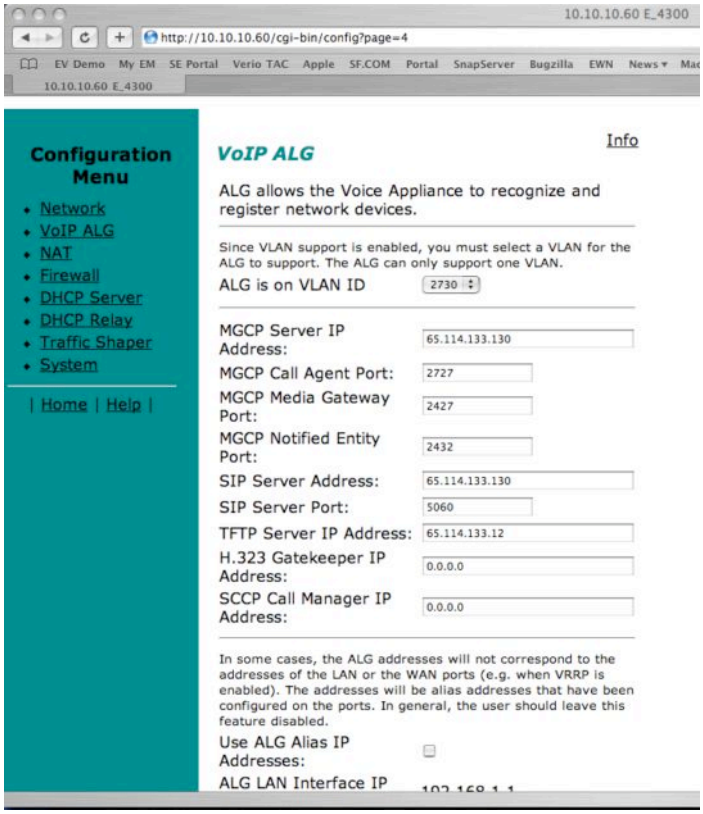
- Enable mobility in the enterprise LAN for voice devices. This is useful, for example, when using WiFi or moving office locations. In these instances the IP address of the voice device may be changed.

Configure the VoIP ALG

In order to configure the VoIP ALG the 4300T must be told where to reach the signaling servers and TFTP server on behalf of the voice devices.

A. Select **VoIP ALG**.

B. If using VLANs assign the ALG to a specific VLAN id using the drop down menu.
C. If you are using MGCP enter the **MGCP Server IP Address, MGCP Media Gateway Port** and **MGCP Notified Entity Port**.
D. If you are using SIP enter the **SIP Server IP Address** and **SIP server port**. The SIP server port is the port used by the SIP registrar. The default value is port 5060.
E. If you are using H.323 enter the **H.323 Gatekeeper IP Address**.
F. If you are using SCCP enter the **SCCP Call Manager IP address**.
G. Enter the **TFTP Server Address**. This address is used to identify the TFTP server that contains the images used by IP phones at boot up. The 4300T performs a TFTP server relay function.


10.10.10.60 E_4300
http://10.10.10.60/cgi-bin/config?page=4
Configuration Menu
Network
VoIP ALG
NAT
Firewall
DHCP Server
DHCP Relay
Traffic Shaper
System
Home | Help
VoIP ALG
Info
ALG allows the Voice Appliance to recognize and register network devices.
Since VLAN support is enabled, you must select a VLAN for the ALG to support. The ALG can only support one VLAN.
ALG is on VLAN ID 2730
MGCP Server IP Address: 65.114.133.130
MGCP Call Agent Port: 2727
MGCP Media Gateway Port: 2427
MGCP Notified Entity Port: 2432
SIP Server Address: 65.114.133.130
SIP Server Port: 5060
TFTP Server IP Address: 65.114.133.12
H.323 Gatekeeper IP Address: 0.0.0.0
SCCP Call Manager IP Address: 0.0.0.0
In some cases, the ALG addresses will not correspond to the addresses of the LAN or the WAN ports (e.g. when VRRP is enabled). The addresses will be alias addresses that have been configured on the ports. In general, the user should leave this feature disabled.
Use ALG Alias IP Addresses:
ALG LAN Interface IP

PLEASE note: It is not necessary to program in an FTP server address if your IP phones use the FTP protocol instead of TFTP to retrieve their images. A relay function is not needed for FTP as the 4300T will forward FTP traffic to the destination server as programmed in your IP phone.

H. **Automatic MGCP Re-registration** is used to re-register MGCP endpoints every time the network or system restarts. Enable this feature to automatically synchronize the softswitch and phones immediately after a restart. The default is Enabled.
I. **The MGCP Re-registration Rate** is used to set the number of MGCP RSIP messages to send per second to the Media Gateway Controller when re-registration is needed. If the MGCP Re-registration Rate needs to be changed, enter a value between 1 and 5. Generally, this value does not need to be modified. The default value is 5 msg/second.
J. The system re-registers clients when it starts up. If any of these re-registration requests fail, the system will wait for the configured number of seconds and then retry the re-registration for the clients that failed. The system will make at most 10 re-registration requests for failed attempts. If the **MGCP Re-registration Retry Delay** needs to be changed, enter a value between 30 and 60 seconds. Generally, this value does not need to be modified. The default value is 30 seconds.
K. The **H.323 TerminalType** is used to specify the type of terminal that the Voice Applicance should use. It can be either endpoint or gateway. The **Maximum Bandwidth** specifies the bandwidth to allow for H.323 calls. The bandwidth is specified in kbps and if it is set to 0, bandwidth management is

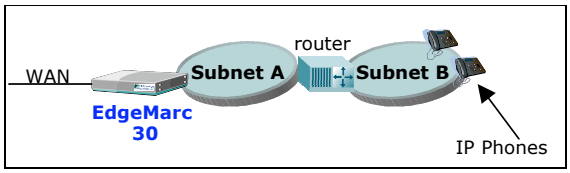
not enforced. Only calls with media traversing the 4300T is counted towards the bandwidth maximum.

L. The **SIP LAN Side Gateway** is used to configure a LAN side SIP gateway to which calls that are not for a registered phone can be sent. The name of the gateway is the name that is configured for the gateway in the soft-switch and the IP address is the address where the gateway can be reached. Please see **Configuring VoIP Survivability in EdgeMarc Appliances** for more information.

M. Press **Submit**.

Configure VoIP Subnet Routing

It is not necessary to configure VoIP subnet routing if all of your voice devices are installed on the same IP subnet as the 4300T. In some installations the voice devices are located in different subnets than the 4300T and connected via intermediate routers. In these instances it is necessary to configure a return path in the 4300T by specifying the intermediate router who knows how to reach the voice devices. This router must be reachable by the 4300T.



PLEASE note: VoIP Subnet Routing is separate and independent from static data routes (see ***Static IP routing***). VoIP subnet routes must be configured for each LAN subnet that contains devices making use of the 4300T's Application Layer Gateway (ALG). These entries tell the ALG that the identified subnet is allowed to make use of its services and what router the ALG should use to reach that subnet.

Enter a VoIP Subnet Route

A. Select **System**.
B. Select **System Overview**.
C. Select **VoIP Subnet Routing**.
D. Enter the **IP Network** (e.g. 10.10.12.0).

This is the IP address of the remote subnet containing the voice devices.

E. Enter the **Netmask** (e.g. 255.255.255.0).

This is the mask of the IP address of the subnet containing the voice devices.

F. Enter the **Gateway** (e.g. 10.10.10.2).

This is the IP address of the intermediate router that knows the return path to the remote subnet from the 4300T.

G. Press **Submit**.

Perform steps A through G for each remote subnet containing the voice devices.

PLEASE note: the 4300T is limited to a total of 20 different VoIP subnets.

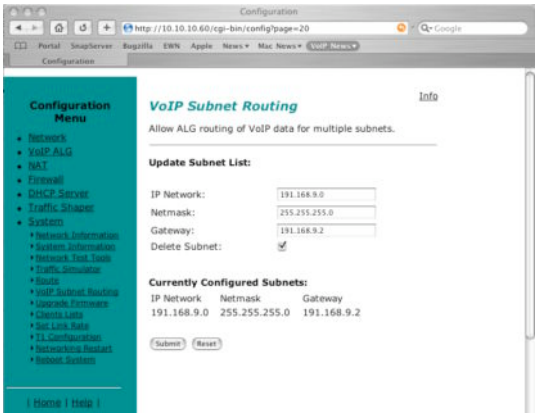
Delete a VoIP Subnet Route

A. Select **System**.
B. Select **System Overview**.
C. Select **VoIP Subnet Routing**.
D. Enter the **IP Network** (e.g. 10.10.12.0) .

This is the IP address of the remote subnet containing the voice devices.

E. Enter the **Netmask** (e.g. 255.255.255.0).

This is the mask of the IP address of the subnet containing the voice devices.



F. Enter the **Gateway** (e.g. 10.10.10.2) .

This is the IP address of the intermediate router that knows the return path to the remote subnet from the 4300T.

G. Select the **Delete Subnet** checkbox.
H. Press **Submit**.

Perform steps A through H for each remote subnet that you wish to delete.

Configure IP Phones, IADs or Softphones

After configuring the 4300T VoIP ALG the voice devices must be configured to point to the LAN interface of the 4300T as their signaling gateway and optionally as their TFTP server (if they use the TFTP protocol to retrieve their software images). The steps required to setup these devices differ from vendor to vendor. Using the DHCP server included in the 4300T will significantly simplify the setup of these devices if they are able to obtain their IP configuration via DHCP. Please consult the applicable users guide of each device for detailed instructions. For your convenience we have provided the configuration steps for a number of these devices in the support section of our website at: www.edgewaternetworks.com

A sample manual IP phone configuration using a Cisco 7960 is provided below.

From the Cisco 7960:

A. Press **settings**.
B. Scroll down to **Network Configuration** .
C. Press **Select**.

D. Scroll down and enter the following parameters:

IP address = LAN IP address of phone e.g. 192.168.1.20

Subnet Mask = Subnet Mask of LAN e.g. 255.255.255.0

TFTP Server = EdgeMarc LAN port IP address= e.g. 192.168.1.1

PLEASE note: The 4300T does TFTP pass-through to the TFTP server address configured in step E of the "Configuring The VoIP ALG" section of this guide.

Default Router = Default router for data on this subnet. This is usually the LAN IP address of the 4300T.

DHCP Enabled = No

E. **Save** the settings.

Note: To reboot your Cisco telephone, press and release the following three buttons simultaneously: "*" + "6" + Settings . Depending on the firmware version in the telephone you may need to "Unlock" the configuration to change a parameter. To unlock the phone, enter * * # on the telephone or by scrolling down the menu options on the phone to the "Unlock Configuration" option.To change a parameter, enter * * # on the telephone.

F. Under settings, select **MGCP configurations**.
G. Set the **Media Gateway Controller address** = the LAN IP address of the 4300T (e.g. 192.168.1.1).

PLEASE note: The 4300T forwards signaling messages sent to this address by the phone to the **MGCP Server IP Address** configured in step D of the "Configuring The VoIP ALG" section of this guide.

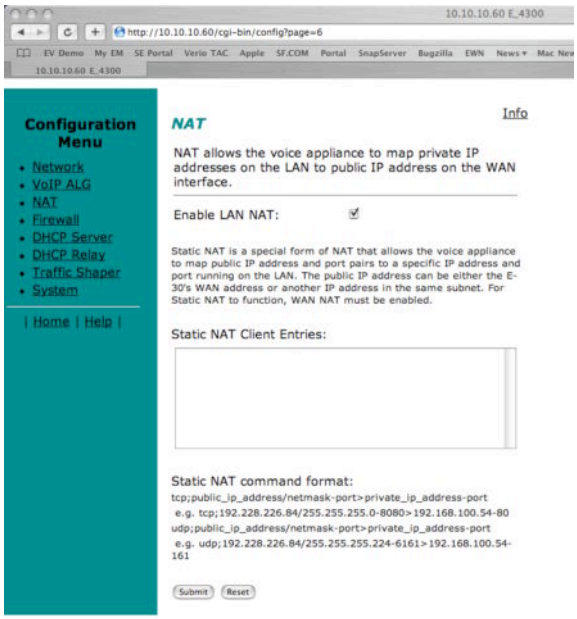
H. **Save** and **Reboot** the telephone.

The phone should now register with the 4300T. To complete the installation a one-time activation code may be required by the network based softswitch or IP PBX. Please consult your service provider or IT administrator for additional information.

Data Networking Configuration

The 4300T provides static IP routing and two types of Network Address Translation (NAT) functions for data traffic. This chapter explains the use and configuration of these features.

NAT for Data Traffic


Configuration Menu
Network
VoIP ALG
NAT
Firewall
DHCP Server
DHCP Relay
Traffic Shaper
System
Home | Help
NAT
Info
NAT allows the voice appliance to map private IP addresses on the LAN to public IP address on the WAN interface.
Enable LAN NAT:
Static NAT is a special form of NAT that allows the voice appliance to map public IP address and port pairs to a specific IP address and port running on the LAN. The public IP address can be either the E-30's WAN address or another IP address in the same subnet. For Static NAT to function, WAN NAT must be enabled.
Static NAT Client Entries:
Static NAT command format:
tcp;public_ip_address/netmask-port>private_ip_address-port
e.g. tcp;192.228.226.84/255.255.255.0-8080>192.168.100.54-80
udp;public_ip_address/netmask-port>private_ip_address-port
e.g. udp;192.228.226.84/255.255.255.224-6161>192.168.100.54-161
Submit
Reset

NAT allows hosts on a private internal network (the LAN side of the 4300T) to anonymously communicate with devices on an external network (the WAN side of the 4300T). The 4300T with NAT enabled will re-write outbound packet headers using public IP addresses in place of private IP addresses so that the private IP addresses are not exposed to the external network. Additionally, the ports used by the IP addresses are also changed as they traverse the 4300T. This is known as Port Address Translation (PAT) and provides an additional security measure. The 4300T maintains a table of these mappings so that return packets can be forwarded to the correct host on the private network.

The 4300T provides two types of NAT functions: dynamic NAT and static NAT. Dynamic NAT allows many private IP addresses to be mapped to a single public IP address (using different port numbers of the public IP address). Static NAT maps private IP addresses and port. For example, mapping a public IP address to a specific machine on the private network responsible for receiving email.

PLEASE note: The 4300T ALG automatically handles NAT for voice devices as described in Chapter 3 "VoIP Configuration".

Configure Dynamic NAT

Use Dynamic NAT when you have multiple PCs installed on the LAN side of the 4300T that require Internet or WAN access. Once Dynamic NAT is enabled the 4300T will automatically perform an address translation for all packets to/from the LAN side PCs.

A. From the **Configuration Menu** select **NAT**.
B. Use the *Enable Lan NAT* checkbox to **enable** or **disable** dynamic NAT.

   The default value for dynamic NAT is **enabled.**

C. Press **Submit**.

Configure Static NAT

Use Static NAT when a server or PC located in the private network needs to be accessible from the external network. Some examples include a corporate web

server, a mail server or an FTP server. In these instances, the 4300T statically maps the public IP address of each server to the actual private IP address of the server.

PLEASE note: In order for Static NAT to function dynamic NAT must be enabled.

A. Select **NAT**.
B. Enter the public and private IP addresses and ports to be mapped in ***Static NAT Client Entries*** using the following format:

   Protocol;PublicIPAddress/netmask-port>PrivateIPAddress-port

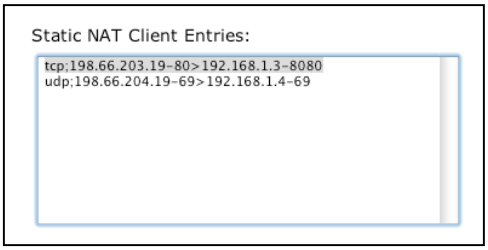
For example, the entry "tcp;198.66.203.19-80>192.168.1.3-8080" will map all web traffic destined to public IP address 198.66.203.19 to the private webserver 192.168.1.3 port 8080. The public IP address of 198.66.203.19 is automatically created as a "subinterface" or "secondary address" on the WAN interface of the 4300T so that external hosts can reach the web server.

Each entry should be placed on a new line.

C. Press **Submit**.

Delete a Static NAT entry

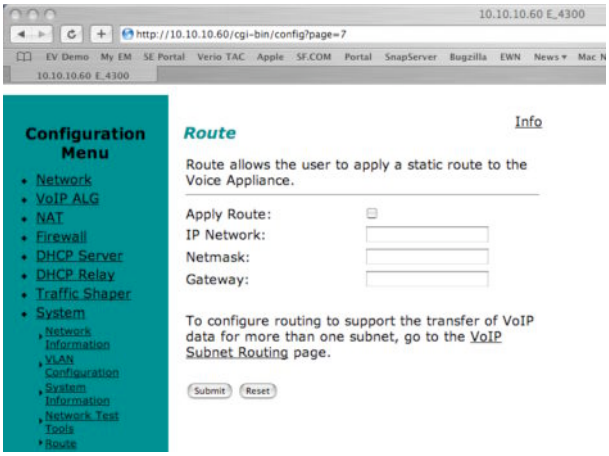
A. Select **NAT**.
B. To delete an IP address or a range of IP addresses **highlight** the entry in the *Static NAT Client Entries* list and press the **Delete** key on your keyboard.
C. Press **Submit**.



Static IP routing

In addition to locally connected IP networks the 4300T can forward traffic for a remote data network by configuring a static route entry. Any packets destined for the remote data network will be forwarded to the specified gateway address in the entry.

Configure the static route



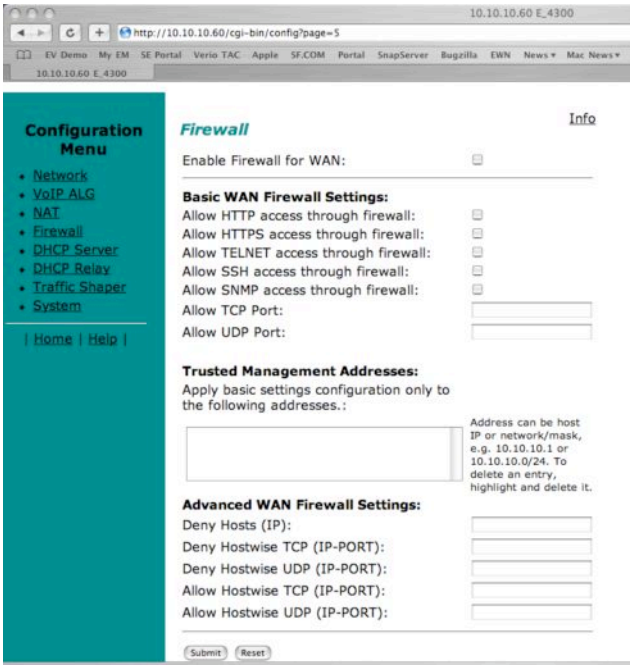
A. Select **System**.
B. Select **System Overview**.
C. Select **Route**.
D. Select the **Apply Route** checkbox.
E. Enter the **IP Network** address. This address is the remote data network you would like the 4300T to forward to the gateway. The hosts portion of the IP address should be set to "0". For example, 10.10.20.0
F. Enter the **Netmask** of the remote data network. For example, 255.255.255.0
G. Enter the **Gateway** IP address of the interface that will receive all packets destined for the remote data network.
H. Press **Submit**.

Delete the static route

A. Select **System**.
B. Select **System Overview**.
C. Select **Route**.
D. Remove the check in the **Apply Route** checkbox.
E. Press **Submit**.

Firewall Configuration

The 4300T uses a Stateful Packet Inspection (SPI) firewall to protect data devices installed behind the LAN interface. Voice devices are protected by the 4300T Application Layer Gateway (ALG) as described in ***VoIP Configuration***.



The firewall is enabled by default. The default behavior of the firewall is to:

- deny all traffic originating from the WAN
- allow all traffic originating from the LAN
- allow only return traffic for connections that originated from the LAN
- deny all traffic originating from the WAN to the 4300T itself
- allow all traffic originating from the LAN to the 4300T

The default behavior can be modified using the basic and advanced settings fields on the firewall configuration page. We recommend that you use the 4300T firewall, however it can be disabled if the 4300T is installed behind an existing legacy firewall.

Enable or disable the firewall

A. Select **Firewall**.
B. Use the **Enable Firewall** checkbox to either enable or disable the firewall.
C. Select **Submit**.

Configure Basic settings

To allow or deny HTTP, Telnet and SSH traffic originating from the WAN to the 4300T simply use the checkboxes provided in the basic settings area of the firewall configuration page. By default, access from the WAN into the 4300T is **disabled**.

WARNING: Denying HTTP, Telnet or SSH traffic from the WAN may result in losing management connectivity to the 4300T if you are configuring the system remotely using the WAN link.

A. Select **Firewall**.
B. Use the three **Allow access from WAN side** checkboxes to enable or disable HTTP, Telnet, and/or SSH access from IP devices on the WAN side of the 4300T.

C. Select **Submit**.

Configure Advanced Settings

A comprehensive security policy can be created using the advanced settings of the 4300T firewall. The policy actions that can be taken on any packet processed by the 4300T are summarized in the following table:

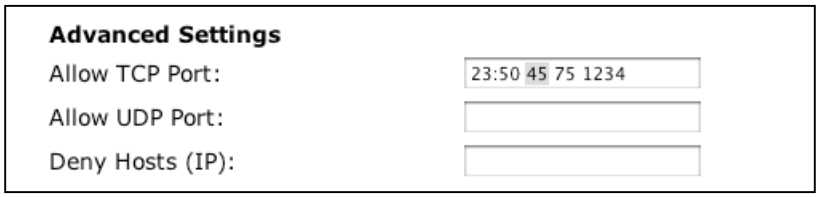
Action	Description	Input format
Allow TCP Port	Allows traffic with the specified TCP port to terminate on the 4300T.	*Valid values range from 1 through 65535. *Multiple entries are separated by a space *Range value specified by ":" character. For example, 25:50 means perform the action on ports 25 through 50
Allow UDP Port	Allows traffic with the specified UDP port to terminate on the 4300T.	*Valid values range from 1 through 65535. *Multiple entries are separated by a space *Range value specified by ":" character. For example: 25:50 means perform the action on ports 25 through 50
Deny Hosts (IP)	Denies all traffic with the source IP address matching the specified hosts	*Multiple entries are separated by a space *Classful IP addresses are assumed by default. For example: 192.168.3.1 uses a class "c" mask. Subnets can be specified using the "/" notation. E.g. 192.168.3.1/24
Deny Hostwise TCP (IP-Port)	Denies all traffic matching the specified TCP port numbers **and** the specified **source** IP addresses	*Multiple entries are separated by a space *Port are specified using a "-" character. For example: 192.168.3.1-23 for Telnet. *Port ranges are specified using a ":" character. For example: 192.168.3.1-23:50 means port 23 through 50 *Classful IP addresses are assumed by default. For example: 192.168.3.1 uses a class "c" mask. Subnets can be specified using the "/" notation. E.g. 192.168.3.1/24
Deny Hostwise UDP (IP-Port)	Denies all traffic matching the specified UDP port numbers **and** the specified **source** IP addresses	*Multiple entries are separated by a space *Port are specified using a "-" character. For example: 192.168.3.1-23 for Telnet. *Port ranges are specified using a ":" character. For example: 192.168.3.1-23:50 means port 23 through 50 *Classful IP addresses are assumed by default. For example: 192.168.3.1 uses a class "c" mask. Subnets can be specified using the "/" notation. E.g. 192.168.3.1/24
Allow Hostwise TCP (IP-Port)	Allows all traffic matching the specified TCP port numbers **and** the specified **source** IP addresses	*Multiple entries are separated by a space *Port are specified using a "-" character. For example: 192.168.3.1-23 for Telnet. *Port ranges are specified using a ":" character. For example: 192.168.3.1-23:50 means port 23 through 50 *Classful IP addresses are assumed by default. For example: 192.168.3.1 uses a class "c" mask. Subnets can be specified using the "/" notation. E.g. 192.168.3.1/24
Allow Hostwise UDP (IP-Port)	Allows all traffic matching the specified UDP port numbers **and** the specified **source** IP addresses	*Multiple entries are separated by a space *Port are specified using a "-" character. For example: 192.168.3.1-23 for Telnet. *Port ranges are specified using a ":" character. For example: 192.168.3.1-23:50 means port 23 through 50 *Classful IP addresses are assumed by default. For example: 192.168.3.1 uses a class "c" mask. Subnets can be specified using the "/" notation. E.g. 192.168.3.1/24

If a given packet does not match any of the configured rules, it is dropped.

A. Select **Firewall**.
B. Enter the desired **Advanced Settings** using the table above as a guide.
C. Select **Submit**.

Remove Advanced Setting Entries

To remove an advanced firewall setting simply highlight the value in the entry box and delete it using the keyboard.



A. Select **Firewall**.
B. Highlight the entry to be deleted in the **Advanced Settings** list and press the **Delete** key on your keyboard.
C. Press **Submit**.

Traffic Management Configuration

Traffic management is required to ensure high quality voice calls when both voice and data traffic share the same WAN link. Voice traffic must be prioritized for transmission over data traffic to meet the stringent jitter, latency and packet loss requirements for toll quality voice. The 4300T:

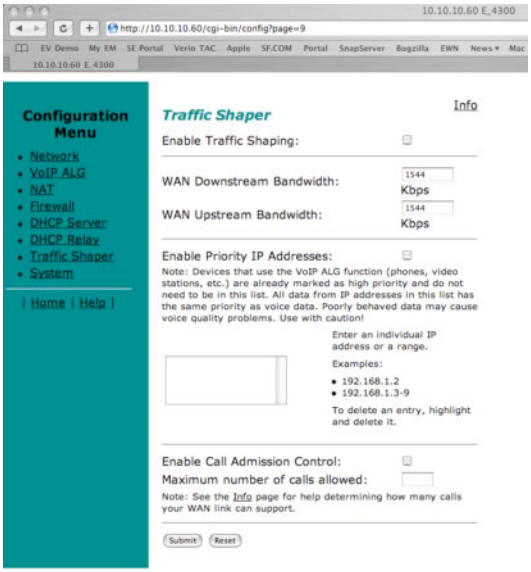
- Automatically prioritizes voice traffic over data traffic to ensure toll quality voice calls.
- Maximizes WAN link utilization by allowing data traffic to burst up to full line rate in the absence of voice calls.
- Controls the data transfer rate of far-end WAN TCP devices to limit WAN link congestion.
- Supports network-based QoS applications by setting the TOS bits for all VoIP packets sent to the WAN and the LAN. TOS bits are used so that VoIP packets can be prioritized in the network by DiffServ enabled routers. The TOS bit value used by the 4300T is to "minimize delay and maximize throughput", or 0xb8 hexadecimal. This value is set for all VoIP packets processed by the 4300T and overwrites any specific TOS bit configuration set by VoIP endpoints.
- Ensures that bandwidth allocated to new voice calls does not adversely affect the quality of existing active calls (Call Admission Control or CAC).

The 4300T combines sophisticated traffic management mechanisms including classification, prioritization, queuing, rate limiting and CAC to ensure toll quality voice calls. Fortunately the system manages this complexity for you and configuring traffic management is very straightforward:

1. Enable traffic shaping.
2. Specify the upstream and downstream bandwidth of your WAN link.
3. Enable CAC.

Please follow the steps below to configure and enable traffic management.

Enable Traffic Shaping



A. From the **Configuration Menu,** select **Traffic Shaper**.
B. Select the **Enable traffic shaper** checkbox.

Specify the upstream and downstream bandwidth of your WAN link

C. Enter the **WAN Downstream Bandwidth** in Kbps.
D. Enter the **WAN Upstream Bandwidth** in Kbps.

Note: For FT1/T1/E1 links the upstream and downstream bandwidths will always be the same value (the link is full-duplex).

Optionally enable priority IP addresses

VoIP traffic from devices that use the VoIP ALG function (phones, video stations, softphones on Pcs, etc.) are already marked as high priority and **do not** need to be manually configured in this list. This list is used to prioritize voice traffic from trunk interfaces of IP PBXs or other high priority devices that do not use the VoIP ALG function of the 4300T.

E. Enter the IP address of other high priority devices in the **priority IP Addresses** box.

You can enter individual IP addresses or a range using by appending a "-" character to the last octet. For example, 10.10.10.2-5 would specify 10.10.10.2, 10.10.10.3, 10.10.10.4 and 10.10.10.5 as voice devices.

WARNING: Care must be taken to ensure that the IP addresses entered do not include data devices such as PCs or workstations. Traffic from these devices will be placed in the priority voice queue internal to the 4300T and burst up to full line rate. This will starve actual voice devices by consuming priority bandwidth and result in dropped calls, busy signals & poor voice quality.

Enable CAC

The 4300T uses CAC to limit the number of active voice calls over the WAN link. This is necessary because a typical installation uses a ratio of 1:2 or 1:4 active voice calls to voice devices on the assumption that 50% or 25% of all users are on the phone at the same time. These ratios are guidelines only and at times the number of concurrent calls may exceed the amount of WAN bandwidth available to process the calls. In this instance existing phone calls will experience poor quality or be dropped all together. To prevent this from occurring a typical voice installation will set a threshold for the maximum number of concurrent voice calls supported by the WAN

access link. New call requests in excess of this threshold will receive the equivalent of a "fast busy" and the WAN link will not become oversubscribed.

For IP Centrex installations the maximum number of concurrent voice calls is usually configured in the 4300T by enabling CAC. When the 4300T is deployed in IP PBX applications the maximum number of concurrent calls **could** be configured in the IP PBX. If the PBX is responsible for this setting you do not need to configure CAC in the 4300T. Please check with your IT administrator to determine if this is the case.

PLEASE note that CAC is available in the 4300T for the MGCP and SIP VoIP protocols only.

Determining the maximum number of concurrent calls

The maximum number of concurrent calls that can be supported by the WAN access link is calculated using the following formula:

Max calls = (Maximum WAN upstream bandwidth * .85)/VoIP codec rate

where,

Maximum WAN upstream bandwidth = value entered in step D above (in Kbps)
VoIP codec rate = 85.6Kbps for G.711 voice devices or 29.6Kbps for G.729 voice devices.

The maximum WAN upstream bandwidth is multiplied by .85 in the formula above to reduce the total bandwidth available for voice calls by 15%. This reduction is necessary because the 4300T automatically reserves 15% of the total WAN bandwidth for low priority data traffic so that it is not starved completely. Starving data traffic completely would increase the number of retry attempts and exacerbate congestion on the link during periods of peak usage.

Examples

The maximum number of G.711 voice calls supported by a T1 (1.536 Kbps) WAN is calculated as follows:

(1.536*.85)/85.6 = 15.3 or 15 total voice calls.

The maximum number of G.711 voice calls supported by a 768Kbps fractional T1 WAN is calculated as follows:

(768*.85)/85.6 = 7.6 or 7 total voice calls

The maximum number of G.729 voice calls supported by a 256Kbps fractional T1 WAN is calculated as follows:

(256*.85)/29.6 = 7.4 or 7 total voice calls

After determining the maximum number of voice calls CAC is enabled as follows:

F. Select the **Enable Call Admission Control** checkbox.
G. Enter **Maximum number of calls allowed** as calculated above.

H. Press **Submit**.

A Closer Look at Traffic Management in the 4300T

The traffic management mechanisms provided by the 4300T are designed to ensure high priority real-time voice traffic is processed before lower priority data traffic. At the same time, bandwidth not in use by voice traffic is made available so that data traffic can burst up to full line rate making efficient use of WAN bandwidth. Traffic management mechanisms are applied to traffic in both the upstream (LAN to WAN) and downstream (WAN to LAN) direction. Each direction is independent of the other and can support different size priority queues.

Classifying

High priority voice traffic generated by endpoint devices such as IP phone and client adaptors are automatically identified by their registration with the EdgeMarc's VoIP Application Layer Gateway. Other VoIP devices (not making use of the ALG) can be defined as high-priority by their IP address. The user configures these addresses into the priority list in the Traffic Shaper section of the 4300T web GUI.

As the 4300T processes packets they are identified as either high or low priority based on this configuration. Packets identified as high priority are marked as such in the TOS bits of their IP header, allowing prioritization by downstream routers. The TOS field is set to 12 hexadecimal "minimize delay and maximize throughput" This value overwrites any prior value.

Upstream Traffic Management

The 4300T appliance uses a combination of Class Based Queuing and simple classless queuing to send data in the upstream direction. The Class Based Queue (CBQ) consists of two priority classes (high and low), a scheduler to decide when packets need to be sent, and a traffic shaper to rate-limit by delaying packets before they are sent. Each of these is described in more detail below.

Priority classes:
Voice traffic is placed in the high-priority queue and data traffic is placed in the low-priority queue. The IP header TOS field of packets in the high-priority queue is set to "minimize delay and maximize throughput".

Scheduler:
High-priority data is polled before low priority data, thereby minimizing the latency for voice traffic. High-priority data is allowed to use up to 85% of the total WAN bandwidth. Although preferential treatment is given to high-priority data, 15% of the WAN link is always reserved so that low-priority data is not starved.
High priority data is polled before lower priority data to reduce overall latency for voice traffic.

Traffic shaper:
To smooth bursts from high speed data links (typically from the LAN Ethernet heading to the WAN) the 4300T appliance uses a buffer that clocks data out at rates not exceeding automatically-calculated maximums. Low-priority data is clocked out at the WAN link's full rate LESS the bandwidth currently being used for high-priority (ie voice) data. High-priority data is clocked out at the WAN's full link rate. Any

long-lasting burst condition in low-priority data will cause these packets to be delayed and, if necessary, dropped.

Downstream Traffic Management

Since the 4300T is the final transmitting device for WAN traffic in the upstream direction (LAN to WAN) it is easy to see how its QoS mechanisms can be applied to traffic it is transmitting to guarantee sufficient bandwidth for voice traffic. We have control over how packets are handed to the WAN interface.

In the downstream direction (WAN to LAN) we are installed at the receiving end of a service provider link and therefore have no control over the amount of voice or data traffic being sent to us over the WAN interface. How then can we still guarantee the quality of in-bound voice traffic when it is entirely possible for an FTP session, for example, to consume the vast majority of downstream bandwidth?

Fortunately this is possible by shaping on both the egress LAN and egress WAN ports of the 4300T appliance and leveraging the congestion avoidance mechanisms built into TCP. Essentially, data packets received by the 4300T's WAN interface at a rate that exceeds the T1's bandwidth LESS the bandwidth used for active voice calls are delayed (then dropped if necessary) before being forwarding on to its LAN interface. Similarly, data traffic sent back to the 4300T for transmission to the WAN are also delayed (as described in the above section). This results in the WAN-based devices following the rules of TCP/IP congestion avoidance and slowing down their transmit rate. This technique is quite effective in practice, as end stations usually reduce their transmit rate before VoIP signaling has completed for new call setup.

For example consider the scenario where there are no voice calls over a WAN link and multiple FTP sessions are consuming all available bandwidth:

1) A new call request is received by the 4300T from the WAN.
2) All signaling messages for the call are classified as voice traffic and therefore prioritized for transmission to the LAN before servicing the inbound FTP data.
3) RTP traffic (the voice data within an ongoing VoIP session) is similarly classified as voice traffic and treated with priority.
4) FTP data is buffered (or dropped) by the 4300T and return data, including the FTP ACKs, are also delayed. This results in a throttling of the transmit rate by the (far-end) FTP hosts, reducing overall WAN bandwidth consumption.

Generally, excessive UDP traffic must be shaped in the service provider network, as UDP does not provide congestion avoidance mechanisms. The exception to this is in the case of RTP UDP-based messages for voice traffic. Although RTP makes use of UDP the 4300T appliance is able to provide its own congestion avoidance mechanism for voice traffic using Call Admission Control (CAC).

VoIP Survivability Configuration

The high availability of voice services is a fundamental requirement for enterprises deploying their own IP telephony equipment or subscribing to hosted VoIP services. In both cases providing reliable communications to remote branch offices is costly usually involving the installation of local call processing servers or additional wide area network (WAN) links to these locations.

Edgewater's VoIP survivability enhances the reliability of VoIP services to branch offices in a cost effective manner by providing local call switching in the event of WAN link failures or a loss of connectivity to network based call processing servers. VoIP survivability is an orderable software option for Edgewater's EdgeMarc Series appliances. EdgeMarc appliances are flexible networking devices that can also be configured to provide IP routing, optional T1 WAN link termination, resolve NAT/firewall traversal problems, ensure high quality voice using QoS, monitor voice call quality and provide comprehensive security for the LAN using a VoIP and data firewall.

Key benefits and features of VoIP survivability

Edgewater's VoIP survivability offers the following important benefits:

- Continuity of voice services to branch offices during WAN link failures or failures in network based call processing servers
- Significant savings over alternative solutions requiring redundant call processing servers or multiple WAN links
- Simplified design that is easier to manage than alternative solutions requiring maintenance of multiple dial plans in distributed call processing servers and complex routing

Survivability features:

- Application layer based monitoring of call processing servers to determine connectivity
- Automatic detection of loss of connectivity to call processing servers caused by WAN link failures, network congestion or call processing server software failure
- Automatic return of call control to network based call processing servers once connectivity has been restored
- Configurable timers to determine call processing server connectivity
- Call processing server connectivity status indicators
- Support for multiple call processing servers using DNS
- Reporting of the currently active call processing server in environments using multiple call processing servers
- Local call switching between VoIP endpoints and premises based PSTN gateways during WAN link failures or other failures that prevent connectivity to network based call processing servers
- Calling features such as transfer, hold and conference are provided by EdgeMarc Series appliances
- Simplified setup that creates a local dial plan in the EdgeMarc appliance by monitoring traffic to network based call processing servers

How survivability works

The EdgeMarc appliance automatically creates a local dialing plan by monitoring the registration requests sent by LAN based SIP user agents as they register with the network based call processing server. In creating this dial plan the EdgeMarc appliance now has knowledge of all local SIP user agents installed on its LAN interface. This dial plan will be used during fallback mode of operation when the EdgeMarc appliance provides local call switching between user agents and/or a LAN side PSTN gateway.

EdgeMarc appliances continuously monitor the status of connectivity to network based call processing servers using application layer heartbeat messages. Configuration settings in EdgeMarc appliances control how often messages are sent to the call processing server and how quickly the server will be declared unreachable in the event of a failure. The use of application layer messages provides the added benefit of detecting the failure condition where an EdgeMarc appliance has IP connectivity to the call processing server but the call processing server software itself is not functioning properly.

Once a call processing server has been declared unreachable EdgeMarc appliances enter fallback mode and perform call processing for local SIP user agents. A SIP PSTN gateway can also be installed at the branch office on the LAN side of the EdgeMarc appliance and used for inbound and outbound calling during fallback mode. To maximize utilization of this gateway it can also be used when call switching is being performed by the network based call processing server.

Once connectivity to the network based call processing server is restored the EdgeMarc appliance will automatically turn control of all subsequent call requests over to the softswitch. Calls in progress that were established while the EdgeMarc appliance was in fallback mode will not be disrupted when connectivity is restored to the network based call processing server.

Redundant or multiple call processing servers can be used in conjunction with EdgeMarc Series appliances to further enhance the availability of voice services. EdgeMarc appliances will use DNS SRV records from a DNS server to obtain a prioritized list of available network based call processing servers. The EdgeMarc appliance using periodic messages monitors each server and the highest priority server that is currently reachable will be used for call processing. This feature can also be used to load balance or distribute calls among multiple servers however state replication is required by the call processing servers to provide full redundancy.

Platform support

EdgeMarc Converged Network Appliances
- 4200 Series
- 4300T Series
- 5300 Series
- 6400 Series

IP Phones
- Polycom IP500 & IP600
- Cisco

PSTN Gateways
- Audiocodes MP-104/108

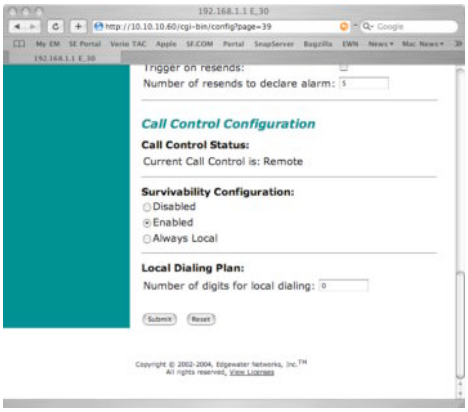
Configuring VoIP survivability in EdgeMarc appliances

Configuring VoIP survivability in EdgeMarc appliances consists of the following tasks:

1. Enable VoIP survivability.
2. Configure call processing server reachability settings (optional).
3. Specify the number of digits to use for local dialing (optional).
4. Configure the IP address of the local LAN side PSTN gateway (optional).
5. Configure call processing server redundancy (optional).

Please note that this configuration requires that you have completed the basic installation of the EdgeMarc appliance including interface, IP, traffic management and VoIP configurations. Information regarding these tasks can be found in the "info" section of the EdgeMarc appliance, the User Manual or in Edgewater's online knowledgebase located in the support section of www.edgewaternetworks.com

Step 1 – Enable VoIP Survivability

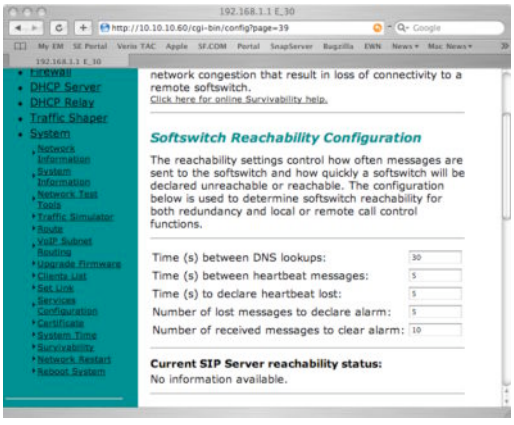


A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
B. Select **System**.
C. Select **Survivability**.
D. Select the **Enabled** radio button under the **Survivability Configuration** section of the web page.
E. Press **Submit.**

The EdgeMarc appliance is now configured to check the connectivity of the call processing server and will automatically perform local call switching if the server becomes unavailable.

Step 2 – Configure call processing server reachability settings (optional)

The reachability settings control how often messages are sent to network based call processing servers and how quickly a server will be declared unreachable or reachable. These settings can be changed to match the particular needs of your environment by using the following steps:


DHCP Server
DHCP Relay
Traffic Shaper
System
network congestion that result in loss of connectivity to a remote softswitch.
Click here for online Survivability help.
Softswitch Reachability Configuration
The reachability settings control how often messages are sent to the softswitch and how quickly a softswitch will be declared unreachable or reachable. The configuration below is used to determine softswitch reachability for both redundancy and local or remote call control functions.
Time (s) between DNS lookups:
Time (s) between heartbeat messages:
Time (s) to declare heartbeat lost:
Number of lost messages to declare alarm:
Number of received messages to clear alarm:
Current SIP Server reachability status:
No information available.

A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
B. Select **System**.
C. Select **Survivability**.
D. Enter the desired values for **Time between heartbeat messages, Time to declare heartbeat lost, Number of lost messages to declare alarm** and **Number of received messages to clear alarm** in the **Softswitch Reachability** section of the web page.

E. Press **Submit.**

The reachability settings are used to determine when the EdgeMarc appliance provides local call switching by entering fallback mode and when it returns call control to network based call processing servers. The definitions of the reachability settings are as follows:

Time between heartbeat messages - The number of seconds between each heartbeat message sent to the call processing servers to determine connectivity.

Time to declare heartbeat lost – The number of seconds that the EdgeMarc appliance will wait before declaring a response to a heartbeat message lost.

Number of lost messages to declare alarm - the number of consecutively lost responses to heartbeat messages required for the EdgeMarc appliance to declare a loss of connectivity to the network based call processing server.

Number of received messages to clear alarm - the number of consecutively received responses to heartbeat messages required for the EdgeMarc Appliance to declare successful connectivity to the network based call processing server.

The formula used to determine the **maximum** time for the EdgeMarc appliance to declare a loss of connectivity to a call processing server is: maximum time = (X * Y) + Z, where,

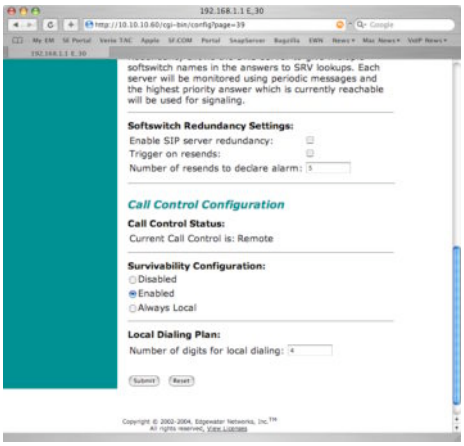
X = Time between heartbeat messages
Y = Number of lost messages to declare alarm
Z = Time to declare a heartbeat lost

The default value for X, Y and Z in the EdgeMarc appliance is 5. Therefore, the default maximum time to declare a call processing server unreachable is 30 seconds or ((5*5) + 5).

Step 3 - Specify the number of digits to use for local dialing

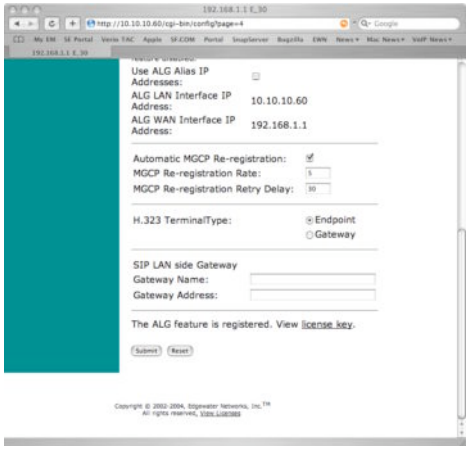
This field is the number of digits that the EdgeMarc appliance will use for dialing when providing local call switching. By default the EdgeMarc appliance will use 4, 7 and 10 digit dialing. Please follow the steps below if you would like to use a different number of digits:

A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
B. Select **System**.
C. Select **Survivability**.
D. Enter the **number of digits for local dialing** in the **Local Dial Plan** section of the web page.
E. Press **Submit.**


softswitch names in the answers to SRV lookups. Each server will be monitored using periodic messages and the highest priority answer which is currently reachable will be used for signaling.
Softswitch Redundancy Settings:
Enable SIP server redundancy:
Trigger on resends:
Number of resends to declare alarm:
Call Control Configuration
Call Control Status:
Current Call Control is: Remote
Survivability Configuration:
Disabled
Enabled
Always Local
Local Dialing Plan:
Number of digits for local dialing:
Submit
Reset

Step 4 - Configure the IP address of the local LAN side PSTN gateway (optional)

This step should be used if you have installed a PSTN gateway at the branch office location. In this case the IP address of the LAN side PSTN gateway must be configured in the EdgeMarc appliance to support inbound and outbound PSTN calling while in fallback mode of operation. This gateway resource may also be used by network based call processing servers when the WAN link is operational. In fallback mode when the call processing server cannot be reached the EdgeMarc appliance will route outbound calls to the LAN side PSTN gateway if a number is dialed that is not stored in its local dial plan (e.g. a local SIP user agent).

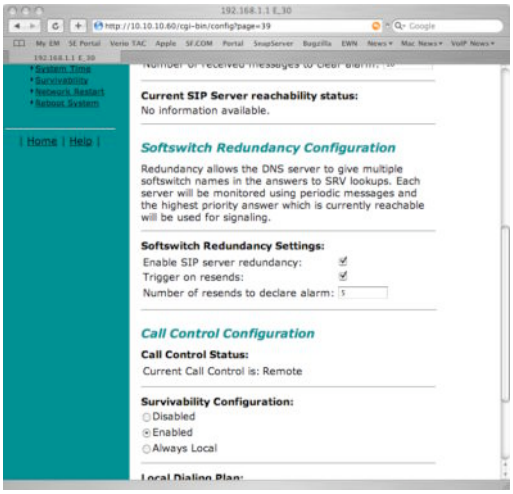


A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
B. Select **System.**
C. Select **Survivability.**
D. Press **Submit.**

Step 5 - Configure call processing server redundancy

If you will be using multiple network based call processing servers then you will need to enable server redundancy and specify the time between DNS lookups in the EdgeMarc appliance. Enabling redundancy allows a DNS server to provide a list of multiple call processing servers to the EdgeMarc appliance in the answers to SRV lookups. Each server in the list will be monitored using periodic messages by the EdgeMarc appliance and the highest priority server that is currently reachable will be used for signaling. The EdgeMarc appliance uses the reachability settings described in step 2 to determine the status of remote servers and remove inoperable servers from the list.

Triggers can also be used by the EdgeMarc appliance to determine when to forward call requests to a secondary server in the list. A trigger is set when a configured number of resends are received by the EdgeMarc appliance from a SIP user agent attempting to place a call. When initiating a call a SIP user agent will send an INVITE message to the EdgeMarc appliance that will then be forwarded to the primary server. In the event that the primary server fails **before** a reachability alarm has been declared using the heartbeat messages the user agent will resend INVITE messages until the trigger condition is met. At this point the EdgeMarc appliance will forward the call request on to the secondary server in the list. Please use the following steps to enable redundancy and set triggers:

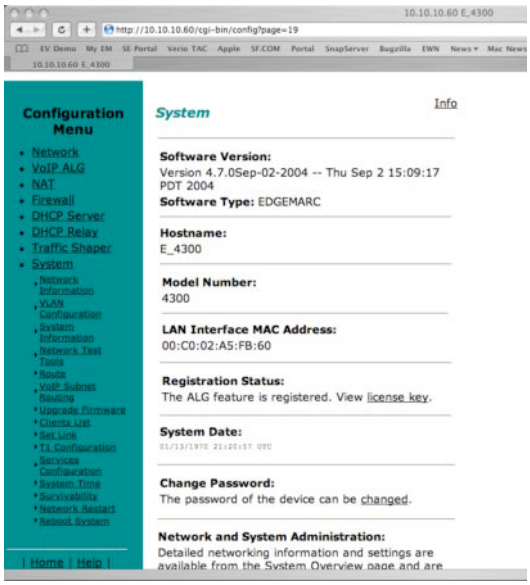

Current SIP Server reachability status:
No information available.
Softswitch Redundancy Configuration
Redundancy allows the DNS server to give multiple softswitch names in the answers to SRV lookups. Each server will be monitored using periodic messages and the highest priority answer which is currently reachable will be used for signaling.
Softswitch Redundancy Settings:
Enable SIP server redundancy:
Trigger on resends:
Number of resends to declare alarm:
Call Control Configuration
Call Control Status:
Current Call Control is: Remote
Survivability Configuration:
Disabled
Enabled
Always Local

A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
B. Select **System**.
C. Select **Survivability**.

D. Enter the **Time between DNS** lookups (in seconds) in the **Softswitch Reachability** section of the web page.
E. Select **Enable SIP server redundancy** in the **Softswitch Redundancy Settings** section of the web page.
F. Select **Trigger on resends** in the **Softswitch Redundancy Settings** section of the web page.
G. Enter the **Number of resends to declare alarm**.
H. Press **Submit.**

Chapter 4: System Diagnostics

The 4300T provides a powerful set of diagnostic information, troubleshooting tools and utilities for system maintenance to network operators.



Viewing Software Version, Hardware Platform and the LAN MAC Address

The software version, hardware platform, and LAN MAC address are common pieces of information requested by technical support and are accessed directly through the **System** page of the 4300T web GUI.

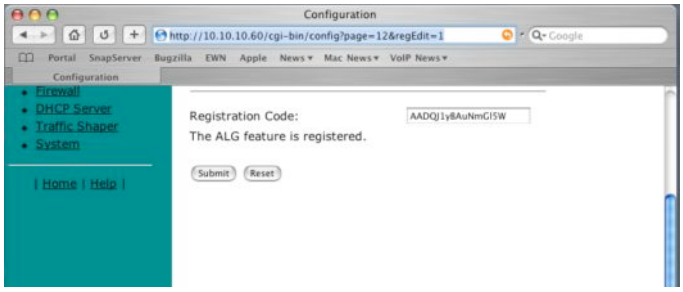
To ensure that you are running the latest software version please visit our website for a complete listing of software releases at:

http://www.edgewaternetworks.com/Support/SupportDocLanding.html#ReleaseNotes

Viewing the ALG registration code

You will also find a link to the ALG registration code on the **System** page. The registration code enables the ALG and is pre-installed at the factory. If the registration code is inadvertently deleted you can re-enter the code using the following steps:

Enter the Registration Code



A. Select **System**.
B. Select **registration code**.
C. Select **Edit Registration Code**.
D. Enter the **Registration Code**.

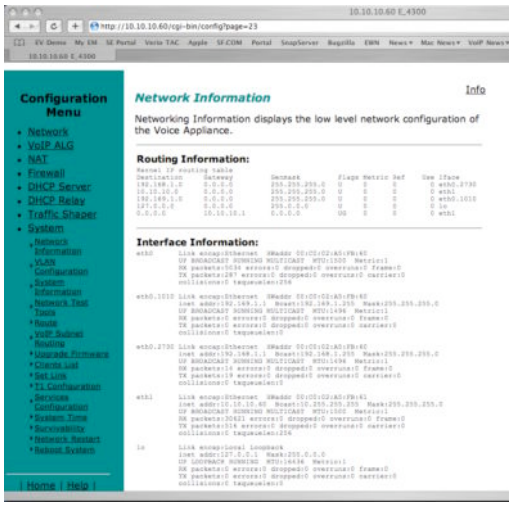
The registration code can be found on the sticker located on the bottom of the 4300T.

E. Press **Submit**.

Viewing Networking Information

To view the networking configuration and status of the 4300T proceed to the **Network Information** page as follows:

A. Select **System**.
B. Select **System Overview**.
C. Select **Network Information**.



The following networking information is displayed:

Routing Information

The system routing table contains the static routes for hosts and networks that are configured on the 4300T. If just the LAN and WAN IP addresses have been configured there will be four lines displayed:

- The private subnet will be associated with the LAN interface.
- A public subnet present for the WAN interface.
- An entry for the 4300T loopback interface
- The 4300T's default gateway forwarding to the WAN interface

Additional lines may be displayed depending on the contents of the Route and VoIP Subnet Routing pages. Each of the entries on these pages will cause an additional entry in the routing table.

Link Status

Link Status displays the status of the ethernet interfaces. Ethernet autonegotiation is often unreliable, especially between different vendors or old and new networking equipment. Failure of autonegotiation is generally not a cause for concern. However, if the negotiated rates change intermittently or the link is reported as down or no link, the link rate may need to be set manually on the *Set Link Rate* page. Intermittent data and voice outages may be caused by link "flapping" when the two endpoints of the Ethernet cable cannot reach agreement using "autonegotiation". If the link rate is set manually, ensure that the device at the far end of the connection can communicate at the desired rate. Incompatible rates can cause a loss of communication with the 4300T.

Link status for the Ethernet ports is displayed via the LEDs adjacent to each physical port.d

Interface Information

The specific status and configuration information for the system interfaces is displayed in the Interface Information section. **HDLC0** shows the interface statistics for the T1/E1 WAN link. **ETH0** shows the interface statistics for the internal LAN interface between the 4300T processor and the built-in LAN switch. Interface statistics for the external LAN ports are not displayed.

The interface statistics can point to areas of congestion in the network. If the errors statistic is a few percent or more of the total packets sent it may be an indication of

excessive congestion on the network interface. If the congestion is not corrected the quality of voice calls will be affected. The topology of the network attached to the network interface with the errors should be examined and modified to better segment and isolate network traffic.

Viewing Advanced System Information

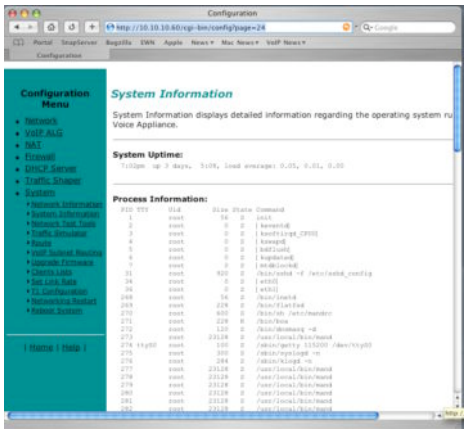
To view advanced system information for the 4300T proceed to the **System Information** page as follows:

A. Select **System**.
B. Select **System Overview**.
C. Select **System Information**.

The following system information is displayed:

System Uptime

System Uptime displays the current time, the amount of time elapsed since the last system reboot, and the system load averages for the past 1, 5, and 15 minutes. Uptime can help trace when a power outage may have interrupted service. Load averages that remain greater than 2 indicate excessive system loading. Partitioning voice traffic using a second system may be required.



Process Information

Displays the active processes in the 4300T.

Memory Usage

Displays detailed memory allocation information that may be of use to technical support.

System Logging Messages

Displays information logged during system boot and normal operation. Logging messages may indicate unauthorized attempts to access the 4300T, process restart messages, and excessive resource utilization messages.

Passive Voice Call Monitoring

The 4300T monitors live voice calls and performs objective speech quality assessment. This information enables the network operator to assess voice quality for the purposes of SLA tracking or problem isolation. Mean Opinion Score (MOS) results for RTP streams in both directions of a VoIP call are calculated at call completion. This information along with the IP addresses of the VoIP endpoints supporting the call are logged locally and optionally sent to an external syslog server (see **Enable Remote System Logging** for instructions on enabling logging to a remote syslog server). Additionally the 4300T will generate a real-time message for any MOS values calculated less than 2.5 (considered poor quality) during an active call.

Voice call quality information is found locally in the **System Logging Messages** section of the **System Information** page and a sample output is provided below.

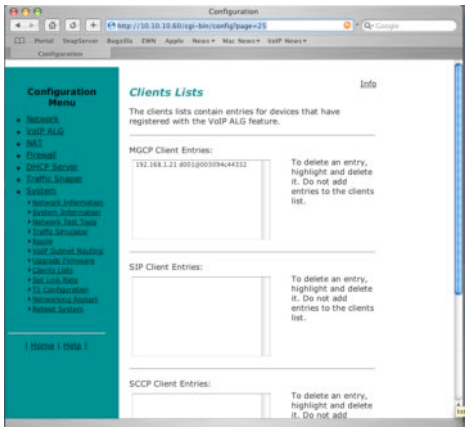
```
Recent Call Log:
<14>Sep 29 17:44:17 mand: Creating call ID 0 between 172.16.38.100 and 209.247.23.73
<14>Sep 29 17:44:56 mand: Ending call ID 0 between 0.0.0.0 and 0.0.0.0
<14>Sep 29 17:44:56 mand: Call ID 0 172.16.38.100->209.247.23.73: Call complete.  Minimum MOS=4.39
<14>Sep 29 17:44:56 mand: Call ID 0 209.247.23.73->172.16.38.100: Call complete.  Minimum MOS=4.39
<14>Sep 29 17:48:00 mand: Creating call ID 0 between 172.16.38.100 and 209.247.23.73
<14>Sep 29 17:49:47 mand: Ending call ID 0 between 0.0.0.0 and 0.0.0.0
<14>Sep 29 17:49:47 mand: Call ID 0 172.16.38.100->209.247.23.73: Call complete.  Minimum MOS=4.39
<14>Sep 29 17:49:47 mand: Call ID 0 209.247.23.73->172.16.38.100: Call complete.  Minimum MOS=4.39
<14>Sep 29 17:52:07 mand: Creating call ID 0 between 172.16.38.100 and 209.247.23.74
<14>Sep 29 17:52:44 mand: Creating call ID 0 between 172.16.38.100 and 209.247.23.74
<14>Sep 29 17:53:34 mand: Call ID 0 172.16.38.100->209.247.23.74 MOS=1.59 below threshold 2.50
<14>Sep 29 17:53:46 mand: Ending call ID 0 between 0.0.0.0 and 0.0.0.0
<14>Sep 29 17:53:46 mand: Call ID 0 172.16.38.100->209.247.23.74: Call complete.  Minimum MOS=1.59
<14>Sep 29 17:53:46 mand: Call ID 0 209.247.23.74->172.16.38.100: Call complete.  Minimum MOS=4.39
```

Accessing Troubleshooting Tools

The 4300T provides convenient test tools to facilitate problem isolation and resolution. A network operator can use these tools to verify connectivity to/from the 4300T as well as trace datapaths to endpoints throughout the network.

Verify Registered Voice Devices

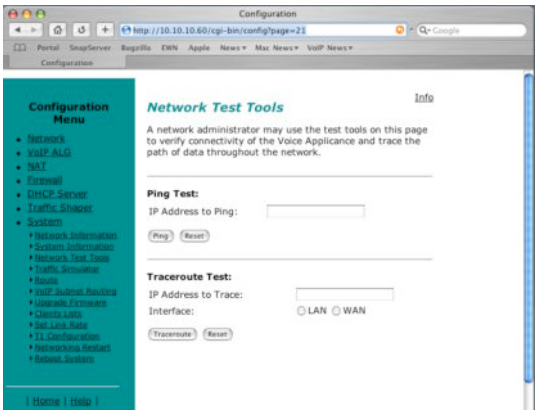
The 4300T maintains a list of all registered voice devices called a "clients list" so that it can properly route voice calls. At startup, voice devices register their IP addresses with the 4300T. The 4300T then registers on behalf of the voice devices by providing its own WAN IP address to the softswitch or IP PBX. If a user or network operator reconfigures the IP address of the voice device (ie. an IP phone or IAD), it will re-register the new address with the 4300T. In this instance voice calls may be routed improperly because the 4300T clients list contains out of date information. To update the clients list simply highlight and delete the stale entry using the following steps:


Configuration
Configuration Menu
Clients Lists
Info
The clients lists contain entries for devices that have registered with the VoIP ALG feature.
MGCP Client Entries:
To delete an entry, highlight and delete it. Do not add entries to the clients list.
SIP Client Entries:
To delete an entry, highlight and delete it. Do not add entries to the clients list.
SCCP Client Entries:
To delete an entry, highlight and delete it. Do not add

A. Select **System**.
B. Select **System Overview**.
C. Select **Clients List**.
D. Proceed to the appropriate signaling section, highlight the duplicate entry or entries and press the **delete** key on the keyboard
E. Press **Submit**.
F. Restart the VoIP ALG by following the instructions found in the *Restarting Networking Process* section of this manual.

Performing a Ping Test

A ping test is the most common test used to verify basic connectivity to a networking device. Successful ping test results indicate that both physical and virtual path connections exist between the 4300T and the test IP address. Successful ping tests do not guarantee that all data traffic is allowed between the 4300T and the test IP address but is useful to verify basic reachability. The following steps are used to perform a ping test:



A. Select **System**.
B. Select **System Overview**.
C. Select **Network Test Tools**.
D. Enter the **IP Address to Ping**.
E. Press **Ping**.

The *Network Test Tools* page will be refreshed and the results of the ping test are displayed (this may take several seconds). The **Reset** button is used to clear the IP address entry used in step "D" above.

Performing a Traceroute Test

A traceroute test is used to track the progress of a packet through the network. The test can be used to verify that data destined for a WAN device reaches the remote IP address via the desired path. Similarly, internal network paths can be traced over the LAN to verify the local network topology. The following steps are used to perform a traceroute test:

A. Select **System**.
B. Select **System Overview**.
C. Select **Network Test Tools**.
D. Enter the **IP address to Trace**.
E. Select either the **WAN** or the **LAN** radio button
F. Press **Traceroute**.

The *Network Test Tools* page will be refreshed and the results of the traceroute test are displayed (this may take several seconds). The *Reset* button is used to clear the IP address entry used in step "D" above.

Restarting Networking Processes

In extreme circumstances while troubleshooting you may be asked to restart the networking processes including the VoIP ALG in the 4300T by technical support. Please use the following steps to restart the networking processes:

A. Select **System**.
B. Select **System Overview**.
C. Select **Networking Restart**.
D. Press **restart**.

WARNING: Restarting network services will interrupt the system for up to a minute. All voice and data sessions currently in progress will be interrupted.

Rebooting the 4300T

In extreme circumstances while troubleshooting you may be asked to reboot the 4300T by technical support. Please use the following steps to reboot the system:

A. Select **System**.
B. Select **System Overview**.
C. Select **Rebooting System**.
D. Press **reboot**.

Alternatively a reset can be performed locally by temporarily disconnecting the power cable from the 4300T.

WARNING: Rebooting the system will interrupt services for a few minutes. All voice and data sessions currently in progress will be interrupted.

Chapter 5: Saving and Restoring the 4300T Configuration

The 4300T stores all configuration information for the system in a series of individual files that reside in local flash memory. These files are read at boot time to determine the configuration identity of the 4300T and then stored in RAM as "running" state. As you configure the 4300T the *submit* command writes the configuration changes to both RAM and flash so that the files stored in flash are always up to date with the running state of the system.

The 4300T provides a utility that enables you to copy the individual configuration files stored in flash to a single, consolidated backup file. This single file can then be used as a backup for the entire system and restored at a later date if necessary. Multiple backup files with different system configurations can also be created and stored locally in the 4300T or on remote TFTP servers.

PLEASE note: No more than 2 backup files can be stored in the 4300T's flash due to size constraints. Also, it is recommended that you create a backup file after any configuration changes are made to the 4300T. This is to prevent the loss of any configuration changes made since your last backup in the event that you must restore the system configuration.

Backup file operations are performed in the 4300T CLI using the **ewn** command.

The ewn Command

The syntax for the ewn command is as follows:

```
USAGE:
  ewn help|list
  ewn save|load|delete [file name]
  ewn upload|download [file name] [ip address]

 where file name must use extension .conf1 or .conf2
```

The **ewn** command can be used with a local terminal connection or remotely using SSH.

A. Use a NULL modem cable to connect to serial port 1 of the 4300T
B. Use a terminal emulator such as Hyperterminal set to a baud rate of 9600, 8, 1 and none (databits, stop bits and parity)

Alternatively you can connect to the 4300T remotely using SSH:

A. Logon as **root**
B. Enter the password

Once you are at the command prompt (#) you can create the backup file, store it to local flash, copy it to a remote TFTP server, copy it from a remote TFTP server, delete it, load it or list all available backup files.

Create a Backup File and Save in Local Flash

ewn save <filename>

Saves the current running configuration.

Filename format (must use extension .conf1 or .conf2):
<filename1>.conf1
<filename2>.conf2

<filenameX> can be a combination of both letters and characters. For example, EWN30_041503.conf1 or location1_E30.conf2. Trying to use any other filename format will result in the error message: "EWN_ERROR_BAD_FILE_NAME".

WARNING: The ".conf" extensions have special significance. If you save a configuration with <filename-new>.conf1, then any existing <filename-old>.conf1 will be overwritten with the new one.

Copy a Backup File to a Remote TFTP Server

ewn upload <filename> <tftp server IP Address>

Copy a backup file from the 4300T to a TFTP server.

Download a Backup File from a Remote TFTP Server

ewn download <filename> <tftp server IP Address>

Download a backup file from a TFTP server to the EdgeMarc.

List the Available Backup Files

ewn list

List all backup files stored in FLASH. If no file has been saved, the command will only return the # prompt.

Delete a Backup File

ewn delete <filename>

Delete the backup file specified in the filename.

Load a Backup File so that it Becomes the Running Configuration

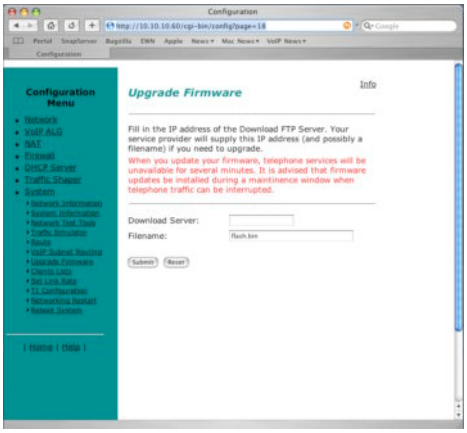
ewn load <filename>

Loads the specified backup file into RAM and makes it the active running configuration.

WARNING: Issuing this command will automatically restart the 4300T and therefore interrupt any active voice calls and data sessions.

Chapter 6: Upgrading the 4300T

This chapter describes how to upgrade your 4300T to the latest software release available from Edgewater Networks. Information on the latest release can be found in the release notes section of our website at:



http://www.edgewaternetworks.com/Support/SupportDocLanding.html#ReleaseNotes

It is recommended that you reboot the 4300T prior to performing the upgrade. This is to make sure there is enough dynamic memory available to handle the upgrade process.

WARNING: When you update your software telephone services will be unavailable for several minutes. It is therefore advised that upgrades be performed during a maintenance window when telephone traffic can be interrupted.

Upgrade Procedure for Software Revision 1.3.11 or Later

Use this procedure if your 4300T is running software revision 1.3.11 or later. The software version can be found on the **System** page of the web GUI.

A. Select **System**.
B. Select **System Overview**.
C. Select **Upgrade firmware**.
D. Enter the **Download Server** IP address of 204.202.2.188

204.202.2.188 is the public IP address of the FTP site hosted by Edgewater Networks.

E. Enter the **Filename**: flash.bin
F. Press **Submit**.

You can follow the progress of the upgrade by selecting the **refresh the upgrade status** link.

WARNING: Do not change the configuration or power off the device until the write is 100 percent complete. The 4300T may become unusable if the write is interrupted. The flash write can take up to 5 minutes depending on the speed of the download server.

The system will automatically restart after the new image has been loaded.

G. Verify that the upgrade was successful by checking the software revision number found on the **System** page

Appendix A: Troubleshooting Tips

This section contains possible solutions to problems regarding the installation of the 4300T. If you cannot find an answer here please visit our website at www.edgewaternetworks.com.

I am having trouble reaching the Internet through the 4300T.

We recommend connecting a PC directly (or via a switch) to the LAN port of the 4300T. The default LAN IP address of the 4300T is 192.168.1.1 so please be sure that the IP address of the PC is on the same network (eg. 192.168.1.2). Once you have connected please verify that the IP configuration information in the *Network* page is correct. Some other items to try:

- Ping the WAN interface of the 4300T from the attached PC
- Ping the DNS server for your network. Sometimes connectivity problems occur when the domain name being used cannot be mapped to the proper IP address.
- Ping a well known address on the Internet (e.g. www.edgewaternetworks.com)
- Ping the IP address of the remote softswitch or IP PBX.

I do not receive dial tone when going "off hook" or my phone will not register with the softswitch/IP PBX.

- Verify the configurations on the *VoIP ALG* page.
- Check that the ALG registration code is configured
  A. Select **System**.
  B. Select **registration code**.
- Attempt to ping the softswitch using the ping tool in the web gui
  A. Select **System**.
  B. Select **System Overview**.
  C. Select **Network Test Tools**.
  D. Enter the softswitch address in the **IP Address to Ping** field.
  E. Press **Ping**.

Appendix B: Contact Information

Contact and Support Information

Edgewater Networks, Inc.
2730 San Tomas Expressway
Suite 200
www.edgewaternetworks.com
Phone: 408.351.7200

General: info@edgwaternetworks.com
Sales: sales @edgewaternetworks.com

Edgewater Networks, Inc. - Technical Assistance Center
Phone: 408.351.7200 ext. 2
support@edgewaternetworks.com

Appendix C: Specifications

WAN Ports	1xT1 CSU/DSU or 10/100 Ethernet
LAN Ports	4x10/100 Ethernet (switched)
Serial Ports	1xRS-232
Dimensions	Height (1.7”), Width (10”), Depth (7”)
Weight	2 lb
Power	12V 3A
Warranty	1 Year

Appendix D: Warranty Information

Hardware Warranty

For a period of one (1) year after shipment of the Product, Edgewater warrants that such Hardware will substantially conform to Edgewater’s published specifications for such Hardware on the date of order if properly used in accordance with procedures described in the documentation supplied by Edgewater. End-user shall notify Edgewater of any nonconformance during the warranty period, obtain a return authorization for the nonconforming Hardware from Edgewater, and return the nonconforming Hardware to Edgewater’s designated repair facility, freight prepaid, with a statement describing the nonconformity. Edgewater’s exclusive obligations with respect to nonconforming Hardware shall be, at Edgewater’s option, to advance replace such Hardware, if it is determined to be defective, or to refund to End-user the purchase price paid for the Product. Advance replacement units are shipped same business day for next-day delivery (within the US) when hardware failure is determined by 1pm PST. Failed components must be returned to Edgewater within 14 days or End-user will be charged for new product purchase.

Software Warranty

Edgewater warrants that the Software on the Product will substantially conform with Edgewater's published specifications for such Software on the date of the order for such Product for a period of ninety (90) days after the shipment of the Product, if properly used in accordance with the procedures described in the documentation supplied by Edgewater. Edgewater's exclusive obligation with respect to nonconforming Software shall be, at Edgewater's option, to: (a) replace that copy of the Software with one that conforms to the specifications; (b) use diligent efforts to provide a correction of the defect, or (c) refund the purchase price paid for the Edgewater Product on which the Software is installed. Defects in the Software must be reported during the warranty period and be reported to Edgewater in a form and with supporting information reasonably requested by Edgewater to enable it to verify, diagnose and correct the defect.

Appendix E: License Information

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END OF TERMS AND CONDITIONS

Appendix F: Certification

FCC PART 68 NOTICE

This equipment complies with Part 68 of the FCC Rules and the requirements adopted by ACTA. On the bottom surface of this equipment is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, this number must be provided to the telephone company.

This equipment uses RJ48C and RJ45 jacks*.*

A Plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by ACTA. See installation instructions for details.

If this equipment, Model 4300T causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice is not practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make the necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment, Model 4300T for repair or warranty information, please contact Edgewater Networks Technical Assistance Center at 408.351.7255 If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

CAUTION: No user serviceable part contains in this equipment.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

If your home has specially wired alarm equipment connected to the telephone line, ensure the installation of Model 4300T equipment does not disable your alarm equipment. If you have questions about what will disable alarm equipment, consult your telephone company or a qualified installer.

INDUSTRY CANADA (IC) NOTICE

This equipment meets the applicable Industry Canada Terminal Equipment Technical Specifications. This is confirmed by the registration number. The abbreviation, IC, before the registration number signifies that registration was performed based on a Declaration of Conformity indicating that Industry Canada technical specifications were met. It does not imply that Industry Canada approved the equipment.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by a user to this equipment, or equipment malfunctions, may give the telephone communications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection, that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas".

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate."

WARRANTY AND REPAIR SERVICE CENTER: Kent McDonald, (403) 266-5840 x100